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OZONE AND CARBON MONOXIDE STANDARDS: NONATTAINMENT ISSUES

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BEFORE THE

SUBCOMMITTEE ON
ENVIRONMENTAL PROTECTION

OF THE

COMMITTEE ON
ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

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OZONE AND CARBON MONOXIDE NONATTAINMENT ISSUES

State and Local Government Control Efforts

THURSDAY, MARCH 26, 1987

U.S. Senate,
Committee on Environment and Public Works,
Subcommittee on Environmental Protection,
Washington, DC.

The subcommittee met, pursuant to recess, at 9:35 a.m., in room 406, Dirksen Senate Office Building, Hon. George J. Mitchell (chairman of the subcommittee) presiding.

Present: Senators Mitchell, Moynihan, Lautenberg, Baucus, Chafee, Stafford, and Durenberger.

OPENING STATEMENT OF HON. GEORGE J. MITCHELL, U.S. SENATOR FROM THE STATE OF MAINE

Senator Mitchell. Good morning, ladies and gentlemen. This is the first in a series of hearings on the attainment deadline facing many air quality regions throughout the country.

The Clean Air Act requires all regions to meet the Federal standards for ozone and carbon monoxide by December 31, 1987, or they may be subject to a ban on construction of new sources of air pollution and a ban on Federal highway funds to limit the growth in mobile source emissions.

Today's witnesses represent areas that for different reasons are not likely to meet that deadline.

Millions of Americans are risking their health every day because they are exposed to unhealthy levels of air pollution.

We cannot responsibly resolve this problem simply by changing the due date for compliance. Areas that have taken progressive steps to comply with the standards should be treated differently from areas that have been more timid or unwilling to even make a sincere effort to comply with emission control requirements.

To avoid imposition of sanctions, States and communities should expect to commit to implementation of effective control measures in the near future. In some cases, adequate results cannot be achieved without further Federal guidance. To combat the regional transport problem faced by the Northeast corridor, for example, minimal Federal requirements for air pollution reductions in up wind areas may be necessary.

The Federal Government could expedite State or local action by supplying affected areas with current information on effective and available control technologies. Tighter tailpipe standards, improved in-use standards, a longer definition of useful life, and other mobile source controls may be necessary to bring areas into attainment.

More stringent inspection and maintenance programs may be necessary including centralized inspection stations and more realistic repair cost waivers. Evaporative emissions from refueling need to be controlled.

These and other options will be considered by the Subcommittee in the coming weeks. I hope we will be able to mark up legislation on clean air including nonattainment and acid rain sometime early this summer so that a solution will be in place long before the deadline of December 31.

I want to, in advance, thank all of the witnesses for coming here today. We look forward to hearing from them, learning from them, and ultimately working with them to achieve a fair and responsible solution to this serious problem.

We are pleased that we are joined today by Senator Durenberger, who has been a very important contributing member of this Committee. Senator Durenberger?

OPENING STATEMENT OF HON. DAVE DURENBERGER, U.S. SENATOR FROM THE STATE OF MINNESOTA

Senator DURENBERGER. Mr. Chairman, I thank you for the opportunity to spend several hours with people who over the years have proven to be genuine experts in the area of controlling a variety of pollutants, particularly air pollutants.

Over the last 6 years, I have spent some time, both in my membership on a related subcommittee of this committee but more particularly in my capacity as the Chair of the Intergovernmental Relations Subcommittee, dealing with the role that States and particularly local governments have been able to play or have been hampered in playing in one way or another in controlling air pollution.

I find today's hearing not only one of great interest but one that I'm sure will make a tremendous contribution to the intergovernmental process of controlling pollutants of one kind or another in nonattainment areas.

I, too, congratulate our witnesses, beginning with our colleague from Colorado and his colleague from Denver and a variety of other representatives of State and local governments who are here with what I would say, Mr. Chairman, is more than the usual degree of credibility behind their statements and I look forward to hearing from all of them.

Senator MITCHELL. Thank you, Senator.

The first panel consists of Senator Wirth of Colorado and Mayor Pena of Denver. Welcome, gentlemen. Senator, we are very pleased to have you here and would ask you to begin.

STATEMENT OF HON. TIMOTHY E. WIRTH, U.S. SENATOR FROM THE STATE OF COLORADO

Senator WIRTH. Mr. Chairman, Senator Durenberger, thank you very much. I am delighted to have this opportunity to be with you in opening this set of hearings this morning as you begin examination of an issue that is crucial to the health of tens of thousands of citizens in my State of Colorado and across the Nation.

As you know, Mr. Chairman, over the past two decades, we have seen many successes in the battle to clean up the Nation's air. I had the privilege of working on the Rogers Subcommittee and then the Waxman Subcommittee on the House side on that issue. I have admired your efforts from afar over the years and I am delighted to have the opportunity to be here on this side and to work with you on this enormously important issue.

While we have made progress in cleaning up the Nation's air, unfortunately in too many Colorado towns and cities and in urban areas across the country, millions of Americans are still exposed to unhealthy levels of air pollution. As you pointed out in your opening comments, the problem is especially acute with respect to carbon monoxide and ozone.

The cities of Colorado Springs, Greeley, Fort Collins and the Denver metropolitan area will fall well short of meeting the carbon monoxide standard, despite their hard work to reduce air pollution. The Denver metropolitan area will meet or come close to meeting the ozone standard but could fall out of compliance by 1992, if we don't find a way to cut auto emissions.

There's no doubt that by the end of this year, many Coloradans will be living in nonattainment areas. Colorado stands to lose millions of dollars in Federal grants for highway construction and sewage treatment plants if we don't meet the ozone standard and a construction ban could be imposed.

We take that possibility very seriously, Mr. Chairman, but we take just as seriously the need to reduce air pollution in our cities and towns. In poll after poll and meeting after meeting, the people of Colorado are saying they want better air quality. They believe that air pollution can be reduced and they are willing to pay for cleaner air. I agree.

We have to clean up the air to protect the health of people living in the cities of Colorado and across the country. Clean air makes good environmental sense and is good economic policy.

The President of the Denver Chamber of Commerce summarized the issue very well when he said "There is a growing recognition by the business community that air quality and economic development are increasingly tied together."

The answer to the nonattainment problem is not, as some would argue, relaxation of the National Ambent Air Quality Standards. That would bring many cities into compliance but it wouldn't clean up the air. The answer is not to provide a blanket extension of time to meet the deadline. The challenge that we all face is to develop legislation that given cities that demonstrate continued progress the additional time they need to clean up the air, but the key is the cities must continue to work along with Federal and State agencies to reduce air pollution. That won't be easy but it can be done if the Federal, State, and local governments work together.

There are some very important things that we can do at the Federal level and that can be required right now by this Congress and by this committee. First, emission standards for cars and trucks must be strengthened. Second, it's time to require that all motor vehicles be certified at high altitudes and at low temperatures that reflect real driving conditions. This is especially important for States like Colorado, where almost all driving occurs at high elevations, often at temperatures very different from those under which the emission devices are tested.

Third, many experts have suggested that we require automakers to install pollution control equipment that lasts for the useful life of the car, 100,000 miles or 10 years.

But right now, we don't even know if cars and trucks are meeting the Federal emission limits. EPA has virtually dismantled its program for randomly testing cars once they are on the road. We just don't know if cars being driven in Colorado are actually meeting the Federal standard. Unfortunately, EPA has abdicated its responsibility on this score and we should tell them in unmistakably clear terms, that we expect them to do testing and to order recalls for models that don't measure up.

These are steps that this Committee can take now that would make a very big difference. There also are other control strategies that we should carefully consider as conditions for a deadline extension.

One of the most promising is oxygenated fuels. Colorado has found that widespread use of oxygenated fuels could cut carbon monoxide pollution in Denver by 30 percent. Mayor Pena, our next witness, and the State of Colorado, can take pride in the fact that Colorado may soon be the first State to require region-wide use of oxygenated fuels during the winter months. Further, expanded mass transit will also be essential over the long term, an issue that I know has been a deep concern to you and is on the Floor right now as we consider the President's veto of the highway and mass transit bill.

This means that the Federal Government will have to do its share. I believe that we should give serious thought to increasing the gasoline tax by a few cents and use those funds to support mass transit in cities with serious air pollution problems.

The bottom line is that legislation is needed, Mr. Chairman, and it is needed this year. Imposing sanctions across the board is not the answer and leaving the problem to EPA withmut our direction is not the answer either. We must ensure that any cities that get more time to meet the national clean air goals continue to work and work hard to meet those standards. That is fair and workable. It means that our national economy will continue to grow while we reduce air pollution.

I look forward to working with you on this important issue, Mr. Chairman, and with the other members of the committee and thank you for the opportunity to open your hearings and be with you this morning.

I would like, if I might, to introduce the good Mayor of the City of Denver, the Honorable Federico Pena, who has taken the city and begun to move that city very dramatically in directions that I think we would all applaud. One of the Mayor's special concerns is our pollution problem in the Denver metropolitan area.

Mayor Pena has been right on the point of that health care issue. It's a great pleasure to have him with us this morning as well.

Senator MITCHELL. Mayor, we are pleased to have you. Before you make your statement, I would like to recognize the presence of Senator Lautenberg of New Jersey, one of the leaders in our Nation in protecting the environment and ask Senator Lautenberg if he has an opening statement he wishes to make.

OPENING STATEMENT OF HON. FRANK R. LAUTENBERG, U.S SENATOR FROM THE STATE OF NEW JERSEY

Senator LAUTENBERG. Thank you Mr. Chairman. I have a brief statement, if I may. I want to welcome our distinguished colleague and friend, Senator Wirth, and the Mayor, of what is perhaps one of the universal cities in our country, Denver. It's the gateway to many beautiful mountain areas and a good ski area, wonderful camping and touring. Denver is a great place to arrive at when one is contemplating business in the West. We know you have a serious problem and we appreciate your work on that.

Mr. Chairman, many thanks for holding this hearing. It is going to allow us to explore the State and local efforts in nonattainment areas. My State, New Jersey, is one of the six nonattainment areas in the Nation. New Jersey and possibly as many as 44 other areas are not expected, unfortunately, to meet the December 1987, deadline for meeting the ozone standard.

Ozone nonattainment is a national crisis. Over 115 million people live in current nonattainment areas. Research has identified serious health effects of ozone. These include temporary impairment of lung functions, chest pain, shortness of breath, and inflammation of the airways. People performing vigorous exercise are particularly sensitive to these effects. We can't allow our citizens to be exposed to these risks.

Recently, environmentalists sued New Jersey, New York and the EPA. They alleged failure to implement controls to reduce ozone. These suits raise serious questions. Has EPA done enough? Have the States met their obligations. What does Congress need to address this problem?

Mr. Chairman, how do we deal with a problem of interstate pollution, namely, the migration of ozone and other air pollutants from one State to another? For States like New Jersey, the interstate question is an important piece of the puzzle.

Today's hearing will allow us to begin to get the answers to these questions, together with the need to pursue another line of questions, namely those on EPA's budget. I am not going to be able to stay here for the remainder of today's hearings. As the Chairman knows, Lee Thomas is going to be testifying this morning before the Appropriations Subcommittee on HUD and independent agencies. To facilitate my participation in both hearings, I ask the Chairman for permission to submit my questions for the record and I again commend you for holding this hearing.

Thank you very much. I thank the witnesses.

Senator MITCHELL. Thank you, Senator. The questions will be submitted to the witnesses in writing and we will hope to get their responses in writing as soon as possible.

I want to acknowledge a statement from Senator Pressler which will be placed at this point in the record.

[The statement referred to follows:]

STATEMENT OF HON. LARRY PRESSLER, U.S. SENATOR FROM THE STATE OF SOUTH DAKOTA

Mr. Chairman, thank you for scheduling this hearing on state and local efforts to control ozone and nitrogen oxide pollution. It is critical that the committee keep in mind state and local efforts when pollution control legislation is considered. Environmental regulations must be a coordinated federal, state and local effort.

I am very interested in some of the state and local initiatives to increase the use of ethanol and methanol fuel to reduce mobile source emissions. The city of Denver has taken a leading role in encouraging the use of oxyenated fuels to reduce auto emissions. Other communities have also taken initiatives to develop methanol as a fuel for city buses. I commend these local initiatives.

The federal government could assist states and local goverments in their efforts to encourage the use of ethanol and methanol. Last week I introduced a sense of the Congress resolution expressing congressional support for efforts to increase their usage. These alternative fuels not only provide environmental benefits but also reduce our dependence on foreign oil and create new markets for farm products. Mr. Chairman, I look forward to learning more about the efforts of state and local governments to meet clean air standards.

Senator MITCHELL. Mayor, welcome.

STATEMENT OF HON. FEDERICO PENA, MAYOR OF DENVER, ON BEHALF OF THE U.S. CONFERENCE OF MAYORS AND THE NATIONAL LEAGUE OF CITIES

Mayor PENA. Thank you very much, Mr. Chairman. I, too, wish to commend you and the other members of the subcommittee for conducting these very important hearings.

Let me first explain my status, because it is a little interesting. I am wearing three hats this morning. One is as the Mayor of the City and County of Denver which, as you know, is part of an area of the country which is currently in noncompliance with carbon monoxide standards. Secondly, I am here representing the Conference of Mayors, and thirdly, I'm representing the National League of Cities.

So I will, with your permission, formally submit my written testimony, representing those three points of view, and I would prefer to simply explain orally our position and my strong feeling about the question of the deadline.

Before I do that, I want to thank the distinguished Senator from Colorado, my good friend, who has been a leader on this issue in the House, and we're pleased that he's going to continue that fight in the Senate.

Senator, thank you very much for being here this morning to help out.

Mr. Chairman and Senator Lautenberg, I'm not going to go over the data regarding the number of cities and parts of the country that are in noncompliance with the Federal Clean Air Act. You are aware of that. You are fully cognizant of the number of cities and areas that are currently in noncompliance.

The important issue that you are facing and that we are facing throughout the country is what to do about the fact that the deadlines for this year will not be met by 70 percent of the standard metropolitan—the largest parts of the areas in the country.

The proposal I am going to make today I hope is one that addresses, Mr. Chairman, your concern earlier about being reasonable and balanced and still trying to support the major goal of the Federal Clean Air Act. That proposal is simply this:

Number one, we do not support any weakening of the standards in the Federal Clean Air Act. We want our feet held to the fire. You have helped us in the past by having a strong Act, and we want to ensure that that Act remains strong in the future. Frankly, we would not have made the progress that we have made thus far if it were not for a strong Act, and we don't want it weakened.

Second, is the answer simply to extend the deadlines unconditionally? Our position is no. The fact is that there are many cities and many parts of the country which have made reasonable, good-faith efforts to comply, and unfortunately there are cities and parts of the country which have not made reasonable, good-faith efforts to comply. If one simply extends the deadline without conditions and does that to every part of the country, the signal you will be sending is that the good-faith efforts that have been made by some cities are for naught, because we will be grouped and classified together with those parts of the country which have not made good-faith efforts.

So what is the solution? Let me offer one.

I recommend, Mr. Chairman and members of the committee, that you develop a new test. You can call it a reasonable efforts test, a best efforts test, a good-faith test. And you develop that test now, and you apply it this year.

For those parts of the country who do not pass that test, they should be subject to some sanctions. By the end of this year, those parts of the country that have not complied with this new test should lose Federal funds. Perhaps they should only lose a portion of their Federal funds—25 percent, 15 percent—but I believe that you need to send a signal, and that is that you are serious about the laws and the amendments and the deadlines that have been changed over the past decade and a half essentially.

Second, those cities which are in compliance with this good-faith test should not be subject to sanctions; however, they should be subject to an annual new State implementation plan which has to be approved, and their performance should be monitored annually, so that by the end of 1988, for example, if they have not taken certain steps that are required in their new plan, they should be subject to some form of sanction.

What criteria would you use in trying to define this new standard? Let me recommend some, Mr. Chairman and members of the subcommittee.

First, has the plan, the State implementation plan that was submitted in 1982, been approved by EPA?

Second, how many elements or strategies in that State implementation plan have actually been implemented? 50 percent of them, 70 percent of them, what percent?

Third, have those jurisdictions taken additional measures, other than those outlined in the State implementation plan, which indicates their good faith and best efforts in trying to comply with the deadlines and to reduce either carbon monoxide or ozone?

Fourth, what has been the extent of intergovernmental cooperation in reaching these goals? This is a vexing issue. In Denver and in the Boulder area, we have a number of cities that are all in the noncompliance area, and we have a relationship with the legislature. And at times, there are those in that area who are more vigorous in seeking strong measures than others, and I think you may need to look at that.

At any rate, there might be other elements or criteria that one might apply to this test to measure whether people have made reasonable efforts.

Let me use Denver as an example, Mr. Chairman, because I think you have to be practical about this. Look at Denver.

Our State implementation plan was not approved in 1982; it has never been approved. That's a subject for another discussion.

Nevertheless, since that time, we have implemented the following parts of the plan.

Number one, an inspection and maintenance program was passed by the legislature, and last year it was tightened up with new amendments.

Second, we have had a successful voluntary, no-drive campaign, which has reduced carbon monoxide by 9 percent.

Third, we have doubled the number of Park-and-Ride programs in the Denver metro area, which was part of our State implementation plan.

Fourth, we have embarked on a freeway ramp metering program, which has helped facilitate traffic and reduce some of the stalling we've seen on the major arterials.

We have implemented exclusive bus routes. We have made traffic signal improvements, and we're making some more. We have completed 582 miles of bicycle routes throughout the Denver metro area. We have constructed a high-occupancy vehicle lane in the southern part of the metro area, and we are doing other things.

So we have implemented practically all of the elements of the original State implementation plan.

In addition to that, we have taken other steps which have not been required. For example, Colorado is the first State in the country to impose carbon monoxide emission standards for wood stoves. We are expanding this to cover fireplaces. By the summer, we will likely be the first State in the country to require oxygenated fuels.

A couple of weeks ago I began to experiment with one of those fuels for city vehicles, and we believe that's going to be followed throughout the metro area.

Denver is the largest city in the country with prohibitions on wood burning and fireplace burning on high-pollution days.

We are reducing traffic congestion and obviously pollution in downtown Denver with the construction of a new, high-occupancy vehicle lane on North I-25, the major highway in Colorado, improving congested intersections, et cetera.

To get to the bottom line, Mr. Chairman and members of the subcommittee, if one applies those criteria and you develop such a test, by the end of this year you can send, I think, three signals to the cities and the parts of the country that are in noncompliance right now.

One, if you have not made good-faith efforts, you should pay a price. Otherwise, the Act has been for naught.

Second, if you have made good-faith efforts, you should be recognized for that and encouraged to continue to make good-faith efforts.

And third, that the Congress is serious about cleaning up the air and the environment in this country, and that we ought not to simply push back the deadline for all the cities without taking into account special efforts made by a number of areas.

Mr. Chairman, that is my concept. It is obvious very general. There are a lot of questions about it, but I'd be happy to pursue it with the committee in additional discussions.

Senator MITCHELL. Well, Mayor, thank you. Let me say that we've had a lot of hearings and a lot of witnesses before this committee, but I can't recall one who was better prepared, had a more specific set of suggestions to make, and I want to assure you that, at least from my standpoint, your views are important and will be given every consideration, and that's very impressive testimony from both you and Senator Wirth.

Before we proceed to questions, I'd like to recognize the distinguished former chairman of the full committee, under whose leadership major environmental legislation was enacted, and ask if Senator Stafford has an opening statement.

OPENING STATEMENT OF HON. ROBERT T. STAFFORD, U.S. SENATOR FROM THE STATE OF VERMONT

Senator STAFFORD. Thank you, Mr. Chairman. I appreciate those remarks and the indulgence of my friend, Senator Lautenberg, to make an opening statement. I had thought of putting it in the record, but I think in this case it's important enough to me, and I hope to some who will hear it, that I wish to deliver it personally.

As you point out, Mr. Chairman, for 6 years I was privileged to preside over hearings such as this one, and usually it was an enjoyable experience and always gratifying.

But with time comes change. Therefore, while I had something to say at virtually every hearing at which I presided, it seemed to this Senator that the time had come to listen to the voices and advice of others. The wisdom of your comments, Mr. Chairman, has convinced me that I made a good decision to do more listening and maybe less talking.

But there also arrives a time when it becomes necessary to speak out, if for no other reason than it provides an opportunity to set the record straight when that is required, and I think this is such a time.

I assume many persons here read the editorial which appeared in last Sunday's edition of the Washington Post entitled, quote: "How Much For Acid Rain?," unquote. It was a provocative collection of statements, many of which, in the judgment of this Senator, were misleading.

But I'll ignore everything except what the editorial had to say about the role of air pollution and its impact upon public health. Frankly, those statements, in this Senator's judgment, were too dangerous to be ignored.

The editorial said, and I am quoting: "Pollution has already been cut to the point at which it no longer appears to threaten human health." That statement is dead wrong, and I expect every person who has spent some time in this room knows that it's dead wrong. That statement appeared in one of our Nation's leading newspapers, and it is a shock and disappointment to me that it's there.

It also suggests that all of us involved in the effort to educate the Nation about the dangers of air pollution have not been getting our message across.

This morning we will spend several hours discussing ways in which the Congress might respond to the failure of up to 75 major metropolitan areas of our Nation to attain the levels of air quality which have been legally defined as safe to health. The main reason we are here today is because the air quality in 75 major cities is so poor that, by definitions of law and science, it does damage human health.

Thus it was with some wonderment that this Senator learned that The Washington Post was seemingly on its editorial page unaware of many things—unaware of the fact that air pollution indeed damages human health; unaware of the fact that tens of millions of Americans live in and breathe air at level that, in fact, damage human health; unaware of the fact that just last month, a group of distinguished scientists told this subcommittee that air pollution is the third leading cause of lung damage in the United States behind only active smoking and passive smoking.

That testimony was presented to us on February 3, 1987, by the Presidents of the American Lung Association and the American Academy of Pediatrics and by a Past President of the American Public Health Association.

Unaware of the fact that a major dilemma facing Congress today is how to reconcile the need to protect human health with the admitted inability of some areas of the country to reduce their air pollution to safe levels at any time in the foreseeable future.

Mr. Chairman, the apparent ignorance of The Post editorial on this subject is not why I asked for the opportunity to speak these words. The Washington Post is, when all is said and done, only one newspaper, no matter how influential it may be in this city. And frankly it has been no friend of this committee's efforts or of the efforts of a majority of our members in the last few years. It opposed our efforts in Superfund repeatedly and was critical of many of the other legislative efforts in the environmental field.

As disappointing as this Senator may find the retreat of what was formerly, in our view, a progressive newspaper on environmental matters, it is surely the right of its owners to say whatever they may wish to say on their editorial page.

Also, I've been in the business of politics and government too long to expect much change to come from criticism of a newspaper or its editorial comments.

The most troubling aspect of all this is that the editorial is merely the latest in a series of troubling events, events that suggest that those organizations upon whom the Congress, the press, and the public have historically relied to provide a balance to the views expressed by industries are no longer doing so, or at the very least, their vigor is much diminished.

I recall when I first joined this committee, Senator Caleb Boggs of Delaware was the ranking minority member of both this subcommittee and of the full committee. He was fond of saying, after hearing from the steel, auto, and other industries, that he also wanted to hear from the League of Women Voters and from the Delaware Garden Club. He trusted them, as others do today, to sort through the complexities of these issues and to shed light, not heat, on the debate.

The Post editorial suggests that this may have become a thing of the past. This Senator recognizes that some would prefer environmental debates to take place in the absence of attention to the health of infants, children, pregnant women, and the elderly. To some, this attention is demagoguery, and I guess those who feel that way are entitled to that view. But the plain truth of the matter is that the Clean Air Act is a public health law. It originated in 1955 because of the congressional concern over public health, and it matured over the years for the same reason. In fact, while this committee would have jurisdiction over the law, even if it were solely to protect the environment, that would not be the case in the other body. Jurisdiction there is founded squarely on its role in protecting the public health.

But clearly, there is abundant misunderstanding on this point and many others as well. Clearly, the spokesmen for industry are doing their job and doing it well. The Post editorial observed, for example, that considerable acid rain control could be achieved through merely switching to low-sulfur coal—a good point, and in all probability a point that brought cheer to the representatives of the low-sulfur coal industry.

But who was there to make an equally good point—but one left out of the editorial—that there is little reason to believe that Midwestern powerplants will switch to cleaner coal on their own without the Congress pushing them in that direction? Those who believe in voluntarism on this point will have to explain why it hasn't already happened.

The utilities are being heard. The coal companies are being heard. The automobile manufacturers are being heard. And they should be heard; they have a right to be heard.

But who is speaking for the children? Where are the lobbyists for the elderly and the infirm? Where are the lobbyists for the millions of American who are exposed every day to unhealthy air?

The Congress is a difficult place in which to be heard in the best of times and on the simplest of issues. Neither of those circumstances pertain here, and that, Mr. Chairman, should concern us all.

Senator MITCHELL. Thank you very much, Senator Stafford, for a very eloquent and most timely statement.

I must say that I associate myself wholly with your views regarding The Post editorial in what is apparently a tragic degeneration of the approach that The Washington Post has been taking, over the years, to environmental matters.

For your information, Senator, I, upon reading the editorial, requested of The Post that I be permitted to submit an opposing statement, and I have been assured that it will be printed, and I hope it will be, although I must say it doesn't match in eloquence the words you've expressed here today.

You're right; the owners of newspapers do have the privilege of saying what they want on the editorial pages. But all newspapers, and at least one of the stature and prestige of The Washington Post, has the obligation to speak with factual accuracy, regardless of the opinions expressed. And the statement that you referred to, totally ignoring the effect of air pollution and acid deposition on human health, reflects either a shocking ignorance of the reality of the facts or a willful disregard for the facts in an effort to make a point of view, both of which are beneath the standards of a great newspaper like The Post. And it was with disbelief and disappointment that I read the editorial, and I'm pleased, Mr. Chairman, you have responded as you have.

This is truly a serious public health question, as both of our witnesses have very eloquently stated here today.

Senator WIRTH. Mr. Chairman?

Senator MITCHELL. Yes, Senator Wirth?

Senator WIRTH. If I might, thank you, Mr. Chairman.

Senator Stafford said at the end of his statement that the Congress is a difficult place to be heard. You were heard very eloquently, very loudly, and very clearly. The evidence that we have seen in Colorado on the public health issues, Senator Stafford, from the National Jewish Hospital and elsewhere on respiratory problems, heart disease, and the relationship of air pollution to the health, particularly as you point out, of the old and the young is clearer with each passing study. And to suggest that this is not the case is absolute poppycock.

Second, I would hope that together you in New England, who have a deep acid rain concern, and those of us in the West who have an emerging concern about acid rain will be able to forge a coalition and get legislation on that front.

We have a very real problem, as you know, with mobile sources, with pollution that comes from copper smelters and other sources. I believe that we together can come up with a strategy that will move very aggressively on this problem.

That comes from not only somebody that is from a clean coal producing State, I will admit that, but more importantly from one who is deeply concerned as so many citizens of the West are, that we address this problem in legislation.

We look forward to working with you not only on the issue in front of us today but also on acid rain.

Thank you again, Mr. Chairman. I'm delighted to be with you and Senator Stafford, and I thank you again for that wonderful, eloquent statement.

Senator MITCHELL. Thank you both, Senator Wirth and Mayor Pena, for your testimony. Mayor, I believe the points you made in your testimony will be the foundation or the starting point for action by this Committee.

Mayor PENA. Thank you.

Senator MITCHELL. I thank you both.

Our next panel includes Mr. Nick Nikkila; Mr. John Paul; and Mr. Bruce Maillet. Would they all come forward, please? Welcome, gentlemen. Under the rules of the Committee and this applies to witnesses who will follow you, all written statements will be placed in the record in full. We ask each witness to orally summarize their written statement, to make their principal points within five minutes. I understand that some of you may want to shift that time and you are free to use it in any manner you wish.

This contraption here is a series of lights and for four minutes, the green light is on. When the orange light comes on, you have one minute. When the red light comes on, we would ask you to summarize with reasonableness. We don't want to cut off anybody arbitrarily. In difference to the other witnesses, we hope you would at that point bring your remarks to a reasonable conclusion.

With that, we welcome Mr. Nick Nikkila who is Director of the Air Pollution Control Program, the Missouri Department of Natural Resources and is also Vice President of the State and Territorial Air Pollution Program Administrators.

Mr. Nikkila, welcome.

STATEMENT OF NICK NIKKILA, STAFF DIRECTOR, MISSOURI AIR POLLUTION CONTROL PROGRAM, AND VICE PRESIDENT, STATE AND TERRITORIAL AIR POLLUTION PROGRAM ADMINISTRATORS

Mr. Nikkila. Thank you, Mr. Chairman, Senator Stafford.

First, we would like to express our appreciation for the convening of this hearing. I think this is a vital issue and we appreciate your efforts in this. We would also like to express our appreciation for your fine staffs. They have extended us every courtesy and assistance and it really helped us in the preparation.

My name is Nick Nikkila and I'm the Staff Director of the Missouri Air Pollution Control Program.

I appear here today on behalf of the State and Territorial Air Pollution Program Administrators, STAPPA, of which I am currently Vice President. Accompanying me today is Mr. John Paul, Supervisor of the Regional Air Pollution Control Agency in Dayton, Ohio. Mr. Paul is the Vice President of The Association of Local Air Pollution Control Officials, ALAPCO, and chairs that Association's Ozone Task Force. STAPPA and ALAPCO are the associations of air pollution control agencies in the 54 States and more than 150 major metropolitan areas across the country.

Senators, we consider ourselves to be the first line of defense in air pollution control with primary responsibility for the implementation of the Clean Air Act. Like you, we are very much concerned that as many as 70 major metropolitan areas in some 40 States continue to experience unhealthy levels of ozone.

We are before you today to share with you our collective recommendations for changes to the Clean Air Act, which would help us meet our common goal of attaining healthier quality levels for both ozone and carbon monoxide as expeditiously as practical.

In general, we think the current Act is a well thought out piece of legislation. We do not believe a major revision is needed. We believe that as a Nation, we should move from a modeling based planning approach to a technology based approach. The current modeling based approach has created a complicated process involving imprecise mathematical modeling that has drained our resources at the State and local area from the real task of cleaning up the air.

As shown in the chart attached to the written testimony, we propose three classifications of air quality areas; attainment; moderate nonattainment and severe nonattainment. Each area of classification would have its own specific set of mandatory control requirements as listed on the chart. Basically the concept is that attainment areas will have to meet certain minimal control requirements, moderate nonattainment areas will have to meet more stringent control requirements and severe nonattainment areas will have to meet increasingly more stringent control requirements.

By our proposal, the moderate nonattainment areas will be required to implement all of the control requirements by no later than December 31, 1992. The severe nonattainment areas would have a more stringent set of control requirements to implement during that same timeframe. Those areas of continuous nonattainment past 1992 must implement an even more stringent set of requirements during the next 5 years.

Failure to implement any of these requirements within the stated timeframe should result in sanctions.

Areas which still have not come into attainment as of December 31, 1997, must develop and submit an implementation plan that contains sufficient reduction commitments to reasonably project attainment by a specific date.

On our chart, you will see requirements to maximize the effectiveness of existing State and local rules. Likewise, we believe U.S. EPA can improve existing Federal requirements through updating previously issued control technique guidelines, new source performance standards and the Federal motor vehicle testing program.

There are basically two kinds of control requirements, those that can be implemented and enforced at the local and State level, and those that must be implemented and enforced at the national level.

In regard to the latter, we believe Congress should mandate that the U.S. EPA develop and implement those national control measures described in the chart. In regard to the former, our past experience has shown that the system works best when U.S. EPA establishes reasonably available control technologies through the promulgation of control technique guidelines.

As a result, we believe Congress should require U.S. EPA to issue control technique guidelines by no later than December 31, 1989, for at least those source categories listed in our position paper. We also believe contingency requirements need to be included in case EPA should fail to issue those CTG's.

From direct personal experience, I can tell you it is extremely difficult for a State to adopt and implement control measures which have not been specifically required by U.S. EPA. After adoption of all reasonably available Federal requirements, including the development of reasonably available control technology for all non-CTG, 100 ton per year sources, we found the St. Louis area would still need additional reductions. As a result, St. Louis, Missouri, is now the third area in the Nation to require Stage II vapor recovery. Like it or not, EPA continues to be perceived as the fount of all environmental knowledge and therefore, if a particular measure is not required by EPA, it is asked, how can it be credible.

While we managed to overcome that hurdle, it was nip and tuck for quite some time. I would venture to say adoption and implementation thus far of Stage II has taken more technical staff time than all of the other control measures with the exception of vehicle inspection and maintenance, that we have implemented to date.

I feel certain that 70 to 90 percent of that effort would not have been necessary had Stage II been a Federal requirement. Probably 50 percent of that effort could have been avoided if the idea had not been fostered that Stage II and onboard controls were opposing control measures and that EPA was leaning towards onboard.

We are painfully aware that no agency at the local or State level is an island. We need the assistance of a progressive and decisive Federal Environmental Protection Agency. While the current Act specifies that U.S. EPA should or shall do this or that, no leverage or forcing mechanism was included to ensure completion in a timely fashion. On the other hand, regardless of action or inaction at the Federal level, we at the local and State level are held accountable and subject to economic sanctions. That fails to recognize the importance of the partnership that must exist if we are to truly meet our clean air goal.

While we support the concept of economic sanctions against those local or state agencies which fail to act in good faith to meet the requirements of the Act, we believe Congress should develop some similar types of leverage to ensure U.S. EPA acts in good faith as well.

Our desire has been to develop a position that would allow expeditious progress towards attainment. We believe we have developed a technically credible approach which provides for a steady improvement of our unhealthful areas with recognition of the varying severities of problems among those areas. While we do not yet know all the answers, we do not believe it is correct to wait and take no action.

Thank you very much for your kind attention. Mr. John Paul has some comments.

Senator MITCHELL. Thank you very much, Mr. Nikkila. Mr. Paul? Welcome.

STATEMENT OF JOHN A. PAUL, SUPERVISOR, REGIONAL AIR POLLUTION CONTROL AGENCY, DAYTON, OHIO AND VICE PRESIDENT, THE ASSOCIATION OF LOCAL AIR POLLUTION CONTROL OFFICIALS

Mr. PAUL. Thank you. Mr. Chairman, Senator Stafford and Senator Chafee, in my testimony today, I would like to explain how the measures called for in the STAPPA/ALAPCO ozone control strategy would be applied to the Dayton area.

Under the STAPPA/ALAPCO strategy, the Dayton area would be termed a moderate nonattainment area. We are one of 27 areas classified by U.S. EPA as being just above the standard. Dayton is representative of areas referred to as a twilight zone city. Such reference applies to an area predicted to attain the ozone standard by December 31, 1982 but which has missed the mark by a marginal degree. The tendency is for such areas like ours to await the vehicle turnover and to pray for good weather. Whereas I am a firm believer in patience and prayer, I feel the citizens of the Dayton area would prefer actions which result in decreased ozone levels.

I'm concerned over the uncertainty of the Dayton area's ability to attain and maintain the ozone standard. In cooperation with the State of Ohio, we have implemented rules which extend beyond the Federal minimum levels. For example, we apply reasonably available control measures on existing sources, and best available control technology on new sources, regardless of source size. Despite these measures, additional emission reductions are necessary to provide a degree of certainty to our quest for attainment.

Ohio is a home rule State and thus permits local governments to adopt ordinances which are more stringent than State requirements. Therefore, we do have the option of adopting local rules to provide the added restrictions. However, the time and energy required to adopt local rules through six county boards of health is such that we always consider Federal or state action as the first choice. Under such a first choice scenario, we have been awaiting a decision by U.S. EPA on Stage II vapor recovery versus onboard controls for at least 8 years.

I have with me a letter on this subject written by Victoria Hathaway Sarver of RAPCA to U.S. EPA on November 30, 1979. The letter references a statement by U.S. EPA personnel promising a decision on Stage II vapor recovery onboard controls by the summer of 1979. I also have with me a July 11, 1985 letter from U.S. EPA to Ohio EPA, which cautions Ohio EPA concerning the controversial nature of Stage II regulations.

I would like at this time to submit these letters for the record.

[The letters referred to follow:]

REGIONAL AIR POLLUTION CONTROL AGENCY
Serving Clark, Darke, Greene, Miami, Montgomery & Preble Counties
451 W. Third Street, P.O. Box 972, Dayton, Ohio 45422, (513) 225-4435

RAPCA

November 30, 1979

Mr. David Hawkins
Assistant Administrator
Office of Air & Hazardous Materials
U.S. Environmental Protection Agency
401 M Street, SW
Washington, DC 20460

Dear Mr. Hawkins:

A member of our agency recently met with the Miami Valley Petroleum Counsel to discuss the recently promulgated Ohio SIP revisions which are applicable to their specific industry. The discussions addressed requirements affecting bulk gasoline plants, bulk gasoline terminals, and gasoline dispensing facilities.

During the meeting, a question was raised as to future requirements of gasoline dispensing facilities; i.e., Stage II vapor recovery. Stage I is currently mandated in the new SIP for all gasoline dispensing facilities having an annual throughput of greater than 240,000 gallons and located in an "urban" county. The Petroleum Counsel's concern is whether Stage II will be a requisite, and if so, will controls be placed at the dispensing facilities or will on-board control strategy be employed?

The industry faces a dilemma with regard to planning for future requirements. If Stage II will be employed at the gasoline dispensing facilities, the preliminary ducting work should be done at the time the tanks are exposed for installation of Stage I vapor recovery. We must agree with representatives of this industry that it would be the epitome of bureaucracy for a small business to comply with the current regulation, and a year later be required to tear up concrete again to install additional control equipment.

Studies of this problem were begun as far back as 1977, with passage of the Clean Air Act Amendments. Mr. Kenneth MacKenzie, President of ALAPCO, wrote to Doug Costle in December, 1978, urging USEPA to consider on-board controls as opposed to on-site control equipment. Mr. William T. Burkhart of our agency wrote Mr. Costle in January, 1979, defining our position with regard to this matter. Mr. Paul Stolpman, USEPA Director, Office of Policy, answered Mr. Burkhart's letter and stated that USEPA should make a policy decision by early summer.

It is now winter and we find ourselves at a loss as to advising this industrial group and are therefore asking that you consider their concerns. We would be most appreciative if you could respond as expeditiously as possible. Thanking you in advance for your cooperation, I remain

Sincerely,

V. Hathaway-Sarver
Victoria Hathaway-Sarver
Air Pollution Control Specialist
Abatement Unit

VHS/sc

cc: Chuck Taylor, Chief
Office of Air Pollution Control
Ohio EPA

16 JUL 1985

Rec'd 9-9-85
Dcm

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION 5
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

REPLY TO ATTENTION OF:

RECEIVED
SEP 9 1985
REGIONAL AIR
POLLUTION
CONTROL AGENCY

CC: BOB H
LARRY J
JIM O J
BILL J
CHUCK T

JUL 11 1985

Mr. Charles M. Taylor, Chief
Division of Air Pollution Control
Ohio Environmental Protection Agency
361 E. Broad Street
Columbus, Ohio 43216

Dear Mr. ~~Taylor:~~ Chuck

This is to confirm the information provided at the June 13, 1985, conference call between the Ohio Environmental Protection Agency (Ohio EPA) and U.S. Environmental Protection Agency (USEPA) regarding your draft schedules of April 4, 1985 (sent in final June 7, 1985) and USEPA's response of May 17, 1985. These schedules concerned the submission of revisions to the Ohio ozone State Implementation Plan (SIP) for the Akron, Cincinnati, and Cleveland areas.

The following information was provided, by your office, during the conference call to address the concerns contained in USEPA's May 17, 1985, letter. The information will be included in the dockets for the Ohio ozone SIPs.

Akron

On June 17, 1985, the State submitted the draft SIP revision which includes the attainment demonstration, analysis and quantification of additional Transportation Control Measures and the EKMA modeling analysis to USEPA.

The Public Hearing is scheduled for June 24, 1985.

The State will submit the final SIP to USEPA by July 1, 1985.

Cincinnati and Cleveland

The State will submit the draft SIP revision which includes an updated attainment demonstration and the EKMA modeling analysis for parallel processing by July 15, 1985.

The State will complete the emissions inventory during July 1985.

The State will announce the public hearing(s) by mid-July 1985.

The State will hold public hearings by mid-August 1985.

The State will complete the EKMA modeling analysis and will submit updated attainment demonstrations to USEPA no later than September 1, 1985, for both areas.

Ract III Rules

Distribution of first draft of regulations occurred on April 26, 1985.

Distribution of second draft of regulations occurred by June 14, 1985.

Mailing of public notice of hearing will occur by July 12, 1985.

The State will file the regulations with the legislature by July 15, 1985.

The State will hold a public hearing by August 28, 1985.

The State will refile the regulations with the legislature by October 15, 1985.

The rules will be adopted by the Director during the week of November 18, 1985.

The State will submit the final SIP revision request to USEPA no later than December 6, 1985.

While it wasn't noted in the conference call, we would also like to comment on the schedule for the development of the RACT III and Stage II regulations. Unless the State determines that Stage II is necessary to demonstrate attainment by the end of 1987, we would recommend that the State be prepared to separate the Stage II regulations from the RACT III regulations. Because it is likely that the Stage II regulations will be controversial, delays in adoption are likely. It is important that the State continue to make expeditious progress to comply with the schedule for adoption of the RACT III rules.

Non-CTG RACT Rules

Ohio EPA committed to review the schedule and will attempt to shorten it, if possible, to approximately mid-1986.

Note: Any emission reductions that occur after December 31, 1987, cannot be considered in the final attainment demonstration. Additionally, Region V cannot assure the State that if these rules contain compliance dates after December 31, 1987 that USEPA will be able to approve them. (Emission reductions that occur after December 31, 1987, can, however, be used to demonstrate maintenance of the standard.)

I hope this accurately reflects the information you provided during our conference call. I encourage you and your staff to closely follow each of these schedules. If you have any questions concerning this matter, please contact Debra Marcantonio of my staff at (312) 886-6088.

Sincerely yours,

Steve Rothblatt, Chief
Air and Radiation Branch

Mr. PAUL. Prior to receipt of that letter, Ohio EPA was considering the adoption of Stage II controls for the Ohio nonattainment areas, but given the lack of support from U.S. EPA, based, I believe on the mistaken belief that the Administrator of U.S. EPA was soon to make a decision favoring onboard controls, Ohio never adopted Stage II regulations.

By the way, Stage II controls for the Dayton area would produce a reduction of 2,500 tons per year of organic compound emissions. This represents 6.7 percent of our current total inventory.

The STAPPA/ALAPCO policy specifies Stage II implementation in nonattainment areas. It also specifies national control measures which would be applied regardless of the attainment status of an area. Page four of the strategy chart lists these national measures. RAPCA personnel examined five of the listed measures and calculated potential reductions of slightly more than 10,000 tons per year. This represents a 26.5 percent reduction in the inventory. These reductions are very significant and if augmented by additional stationary source controls identified as reasonably available control technology by U.S. EPA, would in my opinion assure attainment of the ozone standard in the Dayton area.

The Dayton situation with regard to ozone is not unusual. There are many other areas in the United States with similar borderline attainment problems. It is our hope that Congress will address these problems through legislation which mandates continued VOC emission reductions. The STAPPA/ALAPCO national ozone control strategy presents what we believe to be a sensible approach for defining the needed legislation.

We urge your careful consideration of the measures presented in this strategy. Thank you.

Senator MITCHELL. Thank you very much, Mr. Paul. Before hearing from you, Mr. Maillet, I want to recognize the presence of Senator Chafee, who served for 6 years as Chairman of this Subcommittee with great distinction and is the person singly most responsible in our Nation for reauthorization of the Clean Water Act and much other important environmental legislation.

Senator Chafee, welcome. Do you have a statement?

Senator CHAFEE. Thank you very much, Mr. Chairman, and thank you for those kind comments. I don't have an opening statement.

It's my understanding that Senator Stafford had a comment and an eloquent one, as I understand it, on the editorial in the Washington Post. I want to just say I concur with that. I want to commend you, Mr. Chairman, for pressing ahead with these hearings, despite what the Washington Post says, we need to get on with this, and hopefully under your able leadership, we will be able to do something significant this year.

Like you, Mr. Chairman, I am also on the Finance Committee and I will have to leave shortly. I will convey to them your warm regards and tell them you are dutifully employed.

Senator MITCHELL. Thank you very much, how about otherwise occupied? Thank you, Senator Chafee.

Mr. Maillet, we would be pleased to hear from you.

STATEMENT OF BRUCE K. MAILLET, DIRECTOR, DIVISION OF AIR QUALITY CONTROL, MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL QUALITY ENGINEERING, ON BEHALF OF THE NORTHEAST STATES FOR COORDINATED AIR USE MANAGEMENT, ACCOMPANIED BY MICHAEL J. BRADLEY, EXECUTIVE DIRECTOR, NESCAUM; AND JOHN BASTEY, DIRECTOR, MAINE AIR QUALITY CONTROL PROGRAM

Mr. MAILLET. Thank you, Mr. Chairman, Senator Stafford, and Senator Chafee.

I appreciate the opportunity to testify on behalf of NESCAUM, the Northeast States for Coordinated Air Use Management and the Commonwealth of Massachusetts. I am Director of the Division of Air Quality Control for the Massachusetts Department of Environmental Quality Engineering.

Accompanying me is Michael J. Bradley, Executive Director of NESCAUM, and Mr. John Bastey, the Director of the Maine Air Quality Control Program.

Mr. Chairman, there are many similarities between the position of STAPPA, ALAPCO, and that of NESCAUM; however, because of the widespread ozone problem in the Northeast, NESCAUM would like to offer suggestions that would strengthen the STAPPA position.

NESCAUM is made up of eight air pollution control agencies in the Northeast, the six New England States, New York, and New Jersey. As State Air Quality Management Officials, our top priority is to protect the public from exposure to unhealthy levels of air pollutants. We have no choice about the air we breathe.

Most areas in the Northeast have not yet been able to attain the current health standard for ozone. In addition, recent research into ozone-related health effects indicates that the current health standard may not provide the public with a margin of safety. In light of these facts, NESCAUM recommends that Congress mandate an aggressive ozone control program whose primary goal is attainment of the health standard by a specified date in the near future.

During the past 10 years, numerous industrial and vehicle-related ozone control programs were implemented throughout the Northeast. In fact, the Northeast States have resorted to implementing strategies which go beyond Federal requirements, including the control of very small sources. Also the Northeast States have recently proposed to limit gasoline volatility on a regional basis, which will yield a hydrocarbon reduction of 100,000 tons during the ozone season.

There are many reasons why these Northeast States have fallen short of attaining the ozone standards. These reasons are enumerated in Attachment A to my written testimony.

Three of the most significant factors were, one, failure to recognize the important role of atmospheric transport of ozone and ozone precursors; two, an incomplete understanding of the complex photochemical ozone formation process; and three, a number of significant sources have yet to be adequately controlled.

NESCAUM believes it is essential to formulate revisions to the Clean Air Act which will ensure that these past ozone control shortcomings are overcome. Ozone transport into and throughout the Northeast Corridor as far north as Acadia National Park in Maine is a recognized phenomenon. Transport is also responsible for delivery of ozone at concentrations which inflict damage to forests in regions which would normally be characterized as pristine.

A recently completed study used an urban airshed model to analyze ozone formation in the New York, New Jersey, and Connecticut metropolitan area. This analysis clearly demonstrated that even if the ozone-producing emissions were completely shut off within this entire tristate area for an entire day, violations of the ozone standard would still occur. This analysis demonstrates that there must be substantial reductions in transported pollutants if the New York City metropolitan area is ever to attain the ozone standard.

Revisions to the Clean Air Act should establish a regional control process, requiring a reasonable level of ozone control measures in all States or areas which significantly contribute to downwind nonattainment.

NESCAUM recommends that ozone control regions be established and that the regional ozone attainment plans be implemented. NESCAUM also recommends that Congress institute a technology-based national ozone control program. An ozone control classification system would be established. Each State would be assigned to one of four classification areas, as set forth in my Attachment B.

Clear roles would be established for the USEPA and for State and local agencies. The EPA would be responsible for implementing national applicable control measures, updating existing control technology guidelines, and issuing new CTG's, ensuring the consistent application of ozone control strategies by State and local agencies, strengthening and enforcing the Federal motor vehicle control program, managing the implementation of regional ozone attainment plans, and administering the national oxidant research and application programs.

State and local agencies would be responsible for the State ozone attainment plans, all mandatory stationary and mobile source control methods, Stage II vapor recovery and enhanced vehicle inspection and maintenance programs, and adopting the most stringent measures in severe ozone nonattainment areas such as transportation control measures.

Recognizing the importance of motor vehicle-related emissions, NESCAUM recommends further reducing vehicle exhaust standards and improving the effectiveness of the Federal motor vehicle control program.

State and Federal agencies should be held accountable for their respective responsibilities through the use of effective sanctions and mandatory backup control provisions specified by Congress. Sanctions should be credible.

NESCAUM recommends that Congress establish a national oxidant research and application program to develop a more precise understanding of the processes of oxidant formation and transport, to develop new and alternative control technologies, and to phase these research results into the regulatory control programs on a continuous basis.

The cost of implementing all of the activities included in this national ozone control program will be substantial, requiring new resources for both State and local air quality control programs, as well as the USEPA.

I have attempted to suggest new regulatory mechanisms which NESCAUM States believe will more effectively achieve the goal of ozone attainment and will spread the burden among the various industrial sectors, consumers, and all areas of the country which contribute to widespread ozone nonattainment.

NESCAUM hopes that these comments prove useful to you and to the committee. We are available to assist you with this issue at any time.

Thank you.

Senator MITCHELL. Thank you very much, Mr. Maillet.

Let me ask each of the three of you—and we'll proceed to questioning in the order that the Senators appeared and limit the first round to five minutes each—if you would describe what kind of assistance EPA has provided in your efforts to reach attainment, and, in your judgment, has this assistance been adequate?

Mr. NIKKILA. Well, I think the most valuable assistance that they have provided, as I mentioned, was through the issuance of CTG's and nationally promulgated control measures. That has helped us a great deal. When they define reasonably available control technology, it makes it much easier to implement it at the State and local level.

Senator MITCHELL. That's your response. Okay, Mr. Paul?

Mr. PAUL. I would agree with what Mr. Nikkila said. I would also add to that that the staff at OAQPS in North Carolina have been particularly helpful with us. We have a number of really good contacts with them. We can take problems to them. They'll discuss them with us, and they provide us a lot of good assistance straight through, their technical staff.

Senator MITCHELL. Go ahead, Mr. Maillet.

Mr. MAILLET. Senator, I think the EPA in the early years helped us quite a bit. Their failure to complete the work on the regional oxidant model, ROM, I think has hindered the Northeast States in achieving the standards and understanding what the problem is.

I think, as was brought up in earlier testimony, the lack of the CTG's—in the first few years, there were 17 issued. In the later years, there were very, very few issued, if any at all, and I think that has hindered us. While they were helpful early, they have not been helpful lately.

Senator MITCHELL. Mr. Paul, on pages 2 and 3 of your testimony, you said that EPA wrote the Ohio EPA regarding Stage II regulations.

Could you describe in a little more detail the nature of EPA's communicatio~~n and~~ what effect, if any, it may have had on the States or Dayton's consideration of Stage II?

Mr. PAUL. Yes, sir. The Ohio EPA had in their early drafts of their RACT III regulations Stage II regulations, and we were very supportive of that. We wanted to see Stage II in the Dayton area.

However, in comments on these drafts, USEPA, their Regional Office, Region V Office—and I'll just quote straight from the letter—it says,

> Unless the State determines that Stage II is necessary to demonstrate attainment by the end of 1987, we would recommend that the State be prepared to separate the

Stage II regulations from the RACT III regulations. Because it is likely that the Stage II regulations will be controversial, delays in adoption are likely.

Especially for marginal nonattainment areas, nonattainment areas like the Dayton area, it's very difficult to take one segment and say, "This is absolutely necessary to provide for attainment." Therefore, faced with what was really seen as a lack of support from USEPA for the Stage II regulations, Ohio then backed off of it.

Senator **Mitchell**. The effect was to discourage the adoption of Stage II?

Mr. **Paul**. Yes, sir.

Senator **Mitchell**. Have any of you had similar experiences with respect to EPA in Stage II?

Mr. **Nikkila**. Well, we have adopted Stage II and are currently implementing that. But I have to say that during the process, we often felt that we were not being helped by EPA in the process, in many cases hindered.

Senator **Mitchell**. Yes. Mr. Maillet?

Mr. **Maillet**. Senator, in the 1977 amendments to the Clean Air Act, when all of the States had to develop new implementation plans, EPA took the lead and issued control technique guidelines, and EPA literally imposed their will on the States saying, "Thou shalt adopt these regulations and these guidelines."

That became the norm. That became what we were looking to receive from the leadership at the national level from EPA and, I think, is what Congress had mandated in the 1977 amendments.

Since that time, our State decisionmakers, the legislature, and the industrial community, looked to that leadership. When EPA required something or said, "This is RACT; this is reasonably available control technology," it was adopted. We got I&M in place because of that kind of leadership. The lack of that leadership and the lack of that mandate at the Federal level from EPA regarding Stage II, I think has been a hindrance to the States in going forward on their own.

Massachusetts and the other Northeast States are going forward, trying to do this on a regional basis at this time.

Senator **Mitchell**. For those of you not aware, a vote is now in progress in the Senate, and there will be two votes, one immediately succeeding the other. What I will have to do, in the absence of any Senators, is to recess the hearing briefly to go vote and come back. I estimate that it will be about 15 minutes by the time the first vote ends and the second one begins.

So, I want to first say that Senator Stafford has some questions for you gentlemen, but he had to leave to go vote and to another meeting, so he will submit them in writing, and I ask that you respond to them at your earliest opportunity.

I will also have some other questions for you in writing, but I don't propose to ask you to stay beyond this. As soon as I return from the recess we'll commence with the third and last panel.

So, I thank you gentlemen very much for your participation. The hearing will be in recess for approximately 15 minutes.

Mr. **Nikkila**. Thank you, Senator.

Mr. **Paul**. Thank you.

Mr. **Maillet**. Thank you.

AFTER RECESS

Senator **Mitchell**. Gentlemen, thank you very much for your patience. I apologize for the inconvenience to you and to other persons here.

We'll now begin with Dr. Lents. You might as well proceed in the order in which you're listed on the agenda here.

STATEMENT OF DR. JAMES M. LENTS, EXECUTIVE DIRECTOR, SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Mr. **Lents**. Mr. Chairman and members of the committee, I am James M. Lents, Executive Officer of the South Coast Air Quality Management District. My comments will focus primarily on the South Coast Air Basin in California, a severe nonattainment area for ozone, carbon monoxide and particulates.

I believe the Clean Air Act has served well to improve air quality, by applying Clean Air Act principles and going beyond minimum requirements, peak ozone levels in Los Angeles have decreased by 15 percent, and exposure to episode levels of ozone has decreased by 57 percent, other pollutant levels have similarly improved.

However, it is a fact that we in the South Coast Basin, along with many others, will not achieve the standards that the Act requires by December 31, 1987.

The 1977 amendments contained unrealistic deadlines for the South Coast Air Basin. Emissions in the Basin were and are so great that even if theoretically all industrial sources of air pollution had been removed from the Basin the ozone standard would still have been violated. Similarly, the removal of all mobile sources from the Basin would not allow for attainment of the standards.

While I support ambitious air quality goals, the selection of unattainable goals has detrimental effects on the clean up process. Unobtainable goals, by definition, spell failure and frustration to local decisionmakers because they assure shortfall regardless of the effort made or the technology used.

Similarly, oversight agencies such as the EPA and the California Air Resources Board, sense the futility of forcing the implementation of plans which demonstrate attainment, and therefore, back away from vigorous enforcement.

Federal laws require close and timely interactions between local jurisdictions in their state and federal counterparts. This has not taken place in the past. In fact, it has been a very distant relationship between the South Coast District, the CARB and the EPA. The rulemaking and State Implementation Plan development process require immediate real-time decisions from local policy makers. Today the Federal and State input into the process often takes months even years.

Finally, local agencies often are distracted from their ultimate clean air goals by today's long drawn out piecemeal rulemaking process. Industries and automobile manufacturers play their cards close to the vest and are allowed repeated opportunities to mitigate rules as these move through the complex rulemaking process. Essentially, the present process provides only an incentive for industry to beat the system, not to make it work.

Simply delaying attainment dates will not solve the problem. A number of changes must be made to the Clean Air Act in order to ensure progress. For areas with less severe problems I support the STAPPA/ALAPCO proposals made to you earlier. I offer the following recommendations for the more severe nonattainment areas.

Establish a system of realistic but ambitious 5-year emission reduction increments with Federal overview to include the imposition of appropriate sanctions for failure to act in good faith to meet there reduction increments.

Direct the EPA to track the plan development and rulemaking activities of a given area such as the South Coast Air Basin, on a real-time basis, not months or years later.

All existing sources should apply best available retrofit controls, and that technology should be reviewed every 5 years. The EPA could provide a valuable service in helping agencies to determine what are the best available retrofit controls by researching state and local programs as well as international technology and making this information broadly available.

An emission fee system needs to be developed and imposes some cost on those whose efforts result in weaker rules and hence become higher emitters. By setting realistic fees, one could encourage sources to participate more positively in the rulemaking process.

Require that transportation growth issues be addressed and fully accounted for in the incremental progress reports. If emission growth occurs due to increased driving, a local area must find ways to immediately offset this growth.

Require Federal, State, and local agencies to adopt programs that will ensure that by 1995 total in-use tailpipe emissions from vehicles be no more than 25 percent above those emissions that would be expected if design standards had been met. At the present, vehicles in-use typically admit at least twice the emission certified by the manufacturers. A combination of control system durability requirements on-board diagnostics, and improved local inspection programs could attain this goal.

I've suggested some emission standards for vehicles that I believe are attainable.

Require that per vehicle hydrocarbon emissions be reduced after 1994 by at least 3 percent per year, but allow a credit for introduction of methanol-electric, and other clean fuel vehicles.

Allow for innovative demonstration programs that create equivalent emissions reductions or have the potential to make significant future reductions, but may not conform exactly to the Clean Air Act specifications.

Mr. Chairman and members of the committee, that concludes my testimony. I'll be happy to answer questions.

Senator MITCHELL. Thank you very much, Dr. Lents.

Mr. Schultz.

STATEMENT OF HARVEY W. SCHULTZ, COMMISSIONER, DEPARTMENT OF ENVIRONMENTAL PROTECTION, NEW YORK CITY, ACCOMPANIED BY ROSS SANDLER, COMMISSIONER, NEW YORK CITY DEPARTMENT OF TRANSPORTATION

Mr. SCHULTZ. Thank you, Senator Mitchell, my name is Harvey Schultz, and I am the Commissioner of the New York City Department of Environmental Protection. On my right is Commissioner Ross Sandler of our Department of Transportation.

I am pleased to be here before you today to address the important and complex issues surrounding the impending December 31st deadline for attainment of the carbon monoxide and ozone standards under the Clean Air Act.

New York City's efforts to attain these standards have been, and continue to be extensive. A written statement, which has been submitted to the subcommittee, details our program and the emission reductions they have achieved. In addition, the statement outlines additional steps being formulated to achieve reduction beyond those which our efforts to date have produced.

The extent of our commitment can be seen in the substantial investment of resources that has been made to solve our carbon monoxide and ozone problems. Our efforts to reduce carbon monoxide include an annual expenditure of $31 million for 2,000 traffic enforcement agents, to increase traffic speeds, a $412 million subsidy to the MTA to increase transit ridership, a commitment of $140 million for a capital program designed to improve traffic flow in heavily congested areas, and $29.7 million computerized system which will electronically survey traffic conditions it 3,400 intersections and adjust signal timing accordingly.

To advance attainment of the ozone standard, we have implemented an aggressive program to inspect for compliance with applicable state and city regulations, a lowering of the emissions threshold which triggers the reasonably available control technology requirement, and upgrading of the inspection and maintenance program for light duty trucks, and regulations requiring Stage I Vapor Recovery Systems.

In 1986 alone, 1,700 industrial facility enforcement inspections were conducted resulting in the issuance of 1,000 notices of air code violations and subsequent remediation.

We believe the city in concert with EPA Region II and the New York State Department of Conservation has acted in good faith and in a fashion entirely consistent with the Clean Air Act. But we are concerned about our ability to meet the December deadline. We are committed to attaining the emission standards mandated for the protection of public health, but we can no longer say that we will be able to do so within the mandated period of time.

Neither the Clean Air Act itself, nor its legislative history clearly addresses the inability of all reasonably available control measures to bring about attainment in the area by the deadline. While the State implementation plan developed by EPA, DEC, and the City, did what it was mandated to do incorporating all reasonably available control measures, that same SIP also failed to achieve all that was expected as the carbon monoxide and ozone problems have not been sufficiently remedied.

The Act responds to this situation with a choice between drastic transportation control measures and severe economic consequences or the imposition of sanctions including moratoria on construction or modification of new emitting sources.

In the midst of an otherwise complex, finely tuned, well intentioned implementation scheme, this kind of approach seems very much out of place. Indeed, there is a clear support in the statute that the sanctions are not intended to punish States and localities that, despite good faith efforts, cannot bring about attainment.

In any event, attainment remains our goal, and it is a challenge we are striving to meet. To begin, we must agree upon where we are, assess the effectiveness of measures already employed, and fully understand why some were more effective than others as we develop a strategy to take us from here to there.

New York City has begun this process with EPA, and the State DEC. Mayor Koch will be forwarding to you responses to inquiries by Congressman Waxman and Congressman Dingell, which explain some of the thinking and perspective which have begun to evolve from this process.

The program we hope to devise to achieve further emission reductions reflects the sometimes difficult lessons we have learned.

For example, in order to reduce carbon monoxide emissions, the SIP provides for better traffic management to reduce congestion and increase speeds. These traffic measures have in fact been extremely effective in increasing speeds, thereby increasing capacity.

However, as the traffic move more freely more cars were attracted, once again reducing capacity. If traffic management strategies are, as they appear to be, intrinsically incapable of increasing capacity, solving the city's localized carbon monoxide exceedances will require limiting vehicle access in those areas. We believe that this type of strategy will require economic penalties in order to be effective, and we are prepared to impose them if this proves necessary. New York City does not intend to duck the issue; we will confront it responsibly and effectively.

Another distinction is the difference in the kinds of strategies which may be effective in dealing with carbon monoxide as opposed to ozone. The fact of the ozone matter is simply that, even if emissions in a nonattainment area are regulated down to zero it might still remain a nonattainment area.

In New York City, the implementation of control strategies by upwind communities in large part determines the ambient levels in the city. We are therefore dependent on other jurisdictions to achieve attainment. Regional, if not national approaches will have to be forged in areas such as ours.

The very difficult question is whether additional controls should be mandated for areas which are themselves in attainment, if their emissions result in nonattainment elsewhere. The simple answer to this is, yes, if such attainment area emissions are not controlled, attainment will not be possible in affected nonattainment areas. We believe that ozone nonattainment must be addressed on a regional and national basis. Where necessary, industry related technology-based standards should be extended to apply to existing sources in attainment areas. If the interdependent nature of both the ozone problem, the ozone reduction is not addressed, the nation will not be able to achieve its attainment goals.

It is important to convey the broad perspective from which we believe the current air pollution must be viewed, and the context with the future direction should be determined. While all levels of government must work together to solve the problem, each level of government has a unique role to play. In this regard we can suggest a few areas which we feel that would be profitable for the Congress to concentrate its attention.

In the context of a deadline extension, coupled with appropriate measures to ensure continued progress toward attainment, a post-1987 program for carbon monoxide and ozone should include, among other things, improved tailpipe strategies, enhance inspection and maintenance programs, improved ambient air monitoring; in addition, funding should be made available for alternative fuel research and implementation, for increased basic research regarding ozone formation and transport, and last but not least, for mass transit.

To some extent, we are on both sides of the issue. These intractable public health driven air pollution problems must be resolved, and the kind of gross economic dislocation which could result from failure to solve the problem must be avoided. With the willingness to address the issues squarely, I am confident that a great deal can be accomplished. We must all directly engage in reshaping our thinking and reformulating our programs. New York City is a willing participant in these efforts.

Senator MITCHELL. Thank you, Mr. Schultz. Our final witness this morning is Mr. Theiler. Mr. Theiler, before you begin, I have to go to a Finance Committee hearing from which I believe my colleagues have just come. I am going to ask Senator Baucus to take over the hearing. This is the last witness of the last panel. I will have some questions of you gentlemen in writing as may other members may have.

Thank you very much for your testimony. I thank Senator Baucus and Senator Moynihan for their participation.

Mr. Theiler, you go right ahead.

STATEMENT OF DONALD F. THEILER, DIRECTOR, BUREAU OF AIR MANAGEMENT, WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Mr. THEILER. Thank you. Mr. Chairman, members of the subcommittee, my name is Don Theiler. I am the Director of the Air Management Bureau in the Wisconsin Department of Natural Resources. I am appearing today on behalf of the Wisconsin Department of Natural Resources.

I appreciate the opportunity provided to present the Department's views on the complex issues surrounding attempts by both EPA and the States to obtain the ozone and carbon monoxide standards.

First, let me describe the situation in Wisconsin which we found ourselves in in the 1970's. At that time, violations of the ozone standards were a regular occurrence in the entire eastern half of the State. In the Milwaukee area, violations frequently were more than twice the 0.12 part per million standard. We also had serious carbon monoxide problems in that city.

The State of Wisconsin very aggressively pursued attainment programs for both ozone and carbon monoxide. We have often gone beyond the normal Federal minimum requirements to assure attainment. In this regard, we have Statewide controls on most major stationary sources, controls on most major and minor stationary sources in the southeast one-third of the State regardless of the attainment status.

We have required offsets in the Milwaukee metropolitan area for minor as well as major sources. We have tightened the requirements for our vehicle inspection/maintenance program beyond those mandated by U.S. EPA and we have exceeded the required reduction targets by 15 to 20 percent in the Milwaukee metropolitan area.

These extraordinary efforts have resulted in attainment and maintenance of the carbon monoxide standard in Milwaukee and attainment of the ozone standard in all of the State with the exception of the six counties located in the Milwaukee area.

This effort demonstrates that it is possible to meet the standard in many areas of the nation in a timely manner. Wisconsin is the only State in Region V which has a fully approved ozone State implementation plan. The results of implementing this plan are obvious.

The question remains, why isn't the Milwaukee area meeting the ozone standard as a result of these extraordinary efforts. The answer is contained in two words, interstate transport. The emissions coming northward from the Chicago/Gary metropolitan area overwhelm our control efforts and continue to cause exceedances of the ozone standard.

Our analysis shows that additional reductions in Wisconsin would not substantially affect the situation. Milwaukee lies 90 miles directly north of Chicago and every day on which we have experienced an ozone exceedance during the past 3 years, the winds have generally been from the south.

Even in light of this transport problem, Wisconsin is actively pursuing legislation which will require sources in the Milwaukee metropolitan area to further reduce their emissions. The primary purpose of this legislation will be to ensure that Wisconsin has instituted all reasonably available measures and will be able to eliminate the need to require offsets for new industrial sources wishing to locate in Wisconsin.

The additional measures being contemplated at this time are a strong antitampering program to go with IM; Stage II vapor recovery at all service stations; stringent control on oil based architectural coatings; establishments of limits on auto body refinishing and cleanup solvents; and limiting the VOC content in highway traffic paint. We expect that these additional actions will result in approximately 4,000 tons of additional reductions in VOC's which is an additional 7 percent reduction from the anticipated levels of emissions for 1987.

We intend to do our part to meet the ambient air quality standard for ozone and allow for future growth of our industries. At the same time, we are highly frustrated by the lack of progress in Illinois and Indiana. They have moved very reluctantly to implement even the minimum measures already in place in Wisconsin. Neither of these States has an approved plan and the likelihood of the reductions taking place by the end of this year is virtually nil.

Inexplicably, no sanctions are proposed at this time by U.S. EPA. In light of this situation, the Attorney General of the State of Wisconsin will within the next 2 weeks file a complaint in Federal District Court to force U.S. EPA to intercede and promulgate adequate plans for these two States. This is an unfortunate situation but at this time, we feel we have no alternative.

Obviously, lawsuits such as the one Wisconsin is pursuing are not the best method of dealing with this problem. Changes in the Clean Air Act are needed. Recommendations from STAPPA and ALAPCO are sufficient to deal with most situations but in our opinion, they do not go far enough to adequately recognize and protect States such as Wisconsin from nonperformance by its neighbors.

Our specific recommendations in this regard are contained in a copy of my written remarks which you have before you. I will not go over each of them at this time.

In summary, Wisconsin has met and exceeded the ozone State implementation plan requirements and we are moving to institute further reductions, at the same time, our sister States to the south, Illinois and Indiana, do not even have approved plans, much less the implementation and enforcement resulting from such plans.

An illustration of the impact of this failure to implement and enforce regulations is amply demonstrated by the fact that in December 1986, the Wisconsin DNR was pursuing enforcement actions against 29 significant violators of the VOC regs in the Milwaukee metropolitan area; in contrast, only 14 similar actions are underway in Illinois and 4 in Indiana.

If you have no regulations, you will have no violators. This lack of planning, implementation and enforcement is responsible for the continued exceedances of the ozone standard along the western shore of Lake Michigan. The excess emissions from the Chicago/Gary metropolitan area has resulted in our being forced into taking legal action against U.S. EPA to protect the health of our citizens and the integrity of our air quality control program.

Changes in the Clean Air Act are also urgently needed to help correct this problem and to ensure that once and for all, that it does not reoccur.

Thank you for considering our concerns on this issue.

Senator BAUCUS [presiding]. Thank you very much, gentlemen.

Senator Moynihan, a very distinguished member of this subcommittee, has to leave shortly so we will go to him to ask the first questions.

Senator MOYNIHAN. Thank you, Mr. Chairman.

If I could say to Mr. Theiler, you speak to a repeated theme we encounter which is interstate transport. It's international. We deal with Canadian problems and Canadians deal with our problems, and increasingly we deal with problems generated in Mexico.

I wonder if I can, not to be parochial, to be topical, ask Mr. Schultz, whom we admire so much and who has done such an extraordinary job and we appreciate it; and you know you haven't done enough and you are in trouble, and that's the kind of thing you like to do, solve problems. You have problems. We all have problems with the December deadline.

You made the point that one of your objects in New York City is to increase ridership on mass transit. There is enough density in New York to sustain a transit system and it has been there for almost a century.

The City is providing a $412 million subsidy to increase ridership. It is not unconnected with the requirements of the Clean Air Act; is that not right?

Mr. SCHULTZ. That's exactly right, Senator. It's an attempt to provide to the riding public who is using automobiles and other methods of getting to the City, a real attractive alternative, by getting back onto the subway system.

Senator MOYNIHAN. Tomorrow, the President is going to veto the Surface Transportation Act of 1987, which in another manifestation this committee has put together and taken to the Floor and to Conference. I have been Chairman of the Conference. We have had a unanimous conference and overwhelming votes in both bodies.

The President will be mostly speaking to the highway aspects in terms of $10 billion over budget, $9 billion in rough numbers is the extra transit outlays because we continue the present program and the President wishes to cut it by two-thirds.

If you lost, as you would lose, a two-thirds loss of transit assistance, it would be devastating to a city which is trying to meet air quality standards which the same Congress is saying you have to meet. We say you can't rely any longer on a form of transit assistance and we are going to cut you back explicitly to the provisions of the one cent share of the gasoline tax.

Where would you be in that situation?

Mr. SCHULTZ. I have my colleague, the Commissioner of Transportation, Ross Sandler, who has those numbers.

Senator MOYNIHAN. Mr. Sandler?

Mr. SANDLER. Yes, I'd be happy to. In terms of mass transit funds for New York City, including the Transit Authority, the Ferries, SIRTOA, franchise buses which are also subsidized, the private buses, in 1987, fiscal year 1987, section 9 of those funds would be $303 million; section 3, $96 million. In 1988, it would be $309 million under section 9 and in section 3, $100 million. Section 9 is the funding source for mass transit capital and operating grants; section 3 is the funding source for mass transit capital grants, discretionary as opposed to formula.

We are talking about over $400 million a year which is extraordinarily important to the rebuilding and putting into good repair of the New York City transit system, both the subway system and the commuter lines, all of which serve the central business district of Manhattan.

I want to point out one other thing. In addition to that, as you well know, important subway lines cross our bridges, in particular, the Manhattan Bridge and the Williamsburg Bridge. Both of those bridges as well as the other two East River bridges are old and going through repairs. The cost of those repairs over the next 5 years is well over $350 million, of which $329 million is Federal money and that is part of the discretionary funds and the bridge funds which are also included in the bill you mentioned.

If those bridges are not fixed and repaired according to the schedules we have, then subway service in Manhattan and Brooklyn, particularly the people who use the lines coming in from Brooklyn, will be very severely hurt.

For us, it is both the transit side and the highway side which is so desperately needed for maintaining and rebuilding the service.

Senator MOYNIHAN. It would not be wrong to say that if you lose the transit program and there is a long delay in the highway program, which is connected by transit over the Manhattan and Brooklyn Bridges, you are going to find yourself with the Federal Government just not making it possible for you to meet standards that we described from this Committee?

Mr. SANDLER. Absolutely correct.

Senator MOYNIHAN. That's what I thought. If you see anybody in the White House, would you drop a hint?

Thank you very much for being here. Mr. Chairman I have to get on. Could we have those figures? That would be helpful to us.

Mr. SANDLER. Yes, we would be happy to supply them.

Senator BAUCUS. Thank you very much, Senator. I, too, want to apologize to the panel. I was at the same Finance Committee hearing the other Senators have been to.

The basic question I have, and I apologize if this was addressed, what standards should be set by either the Congress and EPA or standards set by states, and it gets a little bit to the question that Dr. Theiler addressed when you mentioned the problems you are having with Illinois and Indiana's failure to implement their SIP's and the consequent adverse pollution in Wisconsin.

Just based upon your experience, just sit back and give us your own personal views, apart from your official views, personal views as to how we address this transboundary regional problem. Ozone and carbon monoxide does travel distances. It may not travel as great a distance as some other pollutants but it does travel.

I am wondering if perhaps the nature of the transboundary quality of a lot of pollutants, particularly ozone and carbon monoxide, if perhaps we are relying too much on individual States and perhaps we need a more national control. I would like your reaction on that, please.

Mr. THEILER. You are correct. The effects of the ozone forming pollutants don't go as far as some of the measures we have traced with acid rain and some of those which go hundreds and hundreds of miles but it has been our experience—we can trace quite clearly the effects of the Chicago metropolitan plume from the central business district in Chicago all the way north to where the Green Bay Packers play football in Green Bay, Wisconsin, which is about 200 miles north.

Senator BAUCUS. Is that when they were playing the Bears?

Mr. THEILER. Some people say they play. Other people aren't so sure.

The question you have are what standards should be set by EPA and what by the States.

Senator BAUCUS. What do you think about that?

Mr. THEILER. We have formulated, the STAPPA and ALAPCO organizations, have outlined a position on this particular issue. There are a number of things that need to be done directly by EPA. The States trying to do it individually by themselves, it doesn't make sense, such as onboard controls for automobiles and vapor pressure controls on gasoline volatility and house paint, architectural coating requirements. These things are much more effectively done at the Federal level.

On the other hand, certain site specific actions in these problem areas probably are better done by States. Again, those are outlined in our set of recommendations. Stage II vapor recovery, for example, with all of the service stations, should be undertaken individually in the states where the problems occur and in States that are causing problems. We need to have controls in at least large portions of States adjoining these area, again, probably best done at the local level with control technique guidelines and other guidelines provided by EPA.

In the past couple of years, this has just been totally absent in terms of EPA's performance in this regard. We have to have that strong Federal presence in order to do things at the local level, minimums that have to be done and if we don't do them, there has to be very powerful and very real sanctions that occur, because that's the only way we can get things done in many of these areas.

Senator BAUCUS. I would like to know how many agree with the tentative sketchy list of measures that would be controlled directly by EPA that Dr. Theiler mentioned and those others, the vapor recovery that he suggested could be handled locally. Do you agree or disagree with that list?

Mr. SCHULTZ. Basically agree. Stage I is being enforced now by my agency in New York City, it is in place. Stage II, the Mayor instructed me to testify in favor of it. We expect the state will implement it. We actually asked for more stringent regulations that will impact our gasoline stations tremendously but we believe it is necessary. When you have Stage I and Stage II and the automobiles have not yet measured up in terms of all the way they can go, it speaks to a national need to have a strategy.

The issue of transport is particularly where we come out on the issue of ozone. We have and will have, we believe, by the end of the deadline, done everything that has ever been asked of us by Federal EPA in terms of the ozone strategy. We do have this transport issue. The testimony speaks for itself. We speak for very strong regional strategies. We believe there has to be some research behind those strategies. We are not asking people just to impose sanctions on particular contributing localities to our problem without a lot of thought as to what can really be achieved, but that's the only direction we can really recommend.

We are willing to take our local responsibility and we already have in a major way.

Senator BAUCUS. Do you agree that EPA has not done all it could do to help us meet these attainment deadlines?

Mr. SCHULTZ. I would say to you that Chris Daggett, Region II, is basically twisting the arms in our region to get Stage II in place very quickly. He has worked very hard with us, at the same time that our regulator has forced us to do lots of things which have been difficult. I'm not sure that all the resources are there that are needed.

For example, we believe as I said in my testimony, that an alternative fuel program is necessary. We believe that we need improvement in engines, tailpipe emissions. We are willing to—

Senator BAUCUS. What is the cause of the delay?

Mr. SCHULTZ. The cause of the delay is the fact that the automobile industry is still in research and development in these areas in terms of retrofitting engines or developing new engines that are cleaner, that are looking toward alternative fuels.

Senator BAUCUS. Do you think EPA has been lax in that area, that is not encouraging more R&D and moving more quickly?

Mr. SCHULTZ. I just spent three days in Detroit with Charles Gray, Federal EPA, and the motor companies at their R&D level. I believe they are working very, very hard. I think the issue of getting either compressed natural gas or methanol vehicles on line as mainstream production is absolutely required because in New York City, what we would do with this is we would use alternative fuel vehicles for fleet vehicles, for our taxi cabs in our central business district. We have to be able to buy them. We need them.

At the moment, we are still in the experimental stage. Anything that Federal EPA could do with the automotive industry would be helpful. We are still not there. I can't say it is a particular person's fault or entity's fault. We are certainly being encouraged as a city to move in that direction by both the industry and Federal EPA.

Senator BAUCUS. Mr. Lents, what has been the problem with the South Coast Basin's failure to meet the deadline?

Mr. LENTS. Well, as I stated in my testimony, part of the problem is it was impossible to meet the deadlines that Congress set from the outset. However, I think in the short term, we identified several areas where I think we could have done a better job as well as EPA.

Senator BAUCUS. What are some of the control measures that you considered, which have you adopted, of all the options you considered and implemented—if all the adoptions you considered were implemented, how much have emissions have decreased?

Mr. LENTS. We could have probably realistically have accomplished another 10 percent emissions reduction over what we have in the last 5 years. I think there is some more that could have been done, when you consider we were three times the Federal standard. That certainly still leaves us far short of the issue.

Stage II vapor recovery is already in place in Los Angeles. Volatility controls on gasoline is already in place in California. The I&M program there has a much higher failure rate than in other places. The LAER program for new sources goes down to sources that are less than 1 ton a year where the EPA program stops at 100 tons a year.

Senator BAUCUS. Were there any control measures you considered but rejected? There obviously were if you said it could have been better.

Mr. LENTS. Yes. Architectural coatings is an area, painting buildings, bridges, this type of thing, that contribute a significant amount of hydrocarbons to the air. We could have probably moved more rapidly in that area. Coating metal parts is another area with various paints that contribute pollutants to the atmosphere. In that area, as you may now, Los Angeles has a lot of military contractors. We have had a considerable problem getting the military to spec coatings that would meet regulations. It's a common issue we have faced over and over again. Our contractors say, we have to use these coatings because the military specifies them and if you don't allow us to do it, you essentially are putting us out of business. Again, that has hurt cleaning up as fast as we could have.

Senator BAUCUS. One final question. If Congress extends the deadline, what assurance is there we won't have to extend it again?

Mr. LENTS. I don't think there is assurance. That's why I believe Congress has to do more than just extend the deadline. It has to generate a set of expectations that an area should meet in order to qualify for deadline extensions.

Senator BAUCUS. Those are big words. What does that mean?

Mr. LENTS. Well, there are things we can look to. Some of them have been mentioned; methanol vehicles is an area. There are hundreds of methanol vehicles already operating in California. There are methanol buses in California. A number of those need to be brought into the fleets.

I mentioned architectural coatings earlier. We are going to have to push the research to develop water based coatings to cover buildings.

Just the contribution from personal use of products in Los Angeles is surprisingly large, hair sprays, deodorants. We are going to have to get after those kinds of issues in order to make substantial changes. They are not popular issues for local elected officials to address. I think it takes a gorilla in the closet, as Mr. Ruckelshaus referred to a number of years ago, to force areas like ours to take on some of these very difficult to face issues.

Senator BAUCUS. Any other ideas?

Mr. SCHULTZ. Yes. I think that is the main point of all of our thoughts. We are not asking for an extension without some real true direction from Congress specifically. We believe that a true professional effort was made by New York City, New York State, and Region II to put forth a program that would work.

Senator BAUCUS. More precisely, what direction would you like?

Mr. SCHULTZ. The direction we would like is to begin to mandate an alternative fuel program and provide the resources to begin to do that, to begin to give us the kind of assistance in air monitoring with our State that we need. For example, in New York City, we are making judgments about CO and ozone without in our judgment, New York City's judgment, an adequate air monitoring system. We would like judgments to be made on real data rather than models.

We would love to see the direction be put forward that people would like us to go, especially in the alternative fuels area. We are spending an awful lot of time in the last several months trying to decide whether methanol or compressed natural gas is the way to go in New York City. We have a peculiar situation. It will require infrastructure. If we make a mistake with it, we could have a fuel which turns out to be not the fuel of the mainstream used in the next 10 to 15 years. We are very concerned about those areas.

We are willing, as I said, and the Mayor has gone out front in public hearings saying he is willing to look at vehicle reduction strategies, to help reduce the air emissions. That can't be done without mass transit help, as Senator Moynihan pointed out much better than either Ross Sandler or I could.

Senator BAUCUS. New York is going to have 1,300 to 1,800 more taxis?

Mr. SCHULTZ. You have to read that very, very carefully, and I know you have. What basically has happened is we have raised the fares in taxis yesterday. There is a study that will take place in the next year which will evaluate whether taxis could be added to the City. That will be an environmental impact statement.

I assume there will be a strong call for an alternative fuel program with those additional medallions. You could add vehicles if you were doing it the right way, if you were getting the right vehicles, if you had the fuel in place. I think we will begin to be able to demonstrate that in the next several months.

One thing is that the deadline itself is an impediment to progress, just the legality of our sitting down with our counterparts and negotiating things when there is an imposed deadline, does our region have the right to sit down with us and talk about beyond 1987. The fact of the matter is we are because we are pragmatic and we haven't stuck our heads into the ground.

We need assurances that the ammunition will be there.

Senator BAUCUS. If the Congress tells you what to do, you are not going to be back here complaining, are you, you or your successor?

Mr. SCHULTZ. I want to say that if Congress asks us to do and accepts our consultation and advice as they have in the past, we would hope not to come back. We can't guarantee that though.

Senator BAUCUS. Mr. Theiler?

Mr. THEILER. I'd like to agree with Mr. Lents. I think Congress just must do more than extend the deadline and recognize also that in some limited areas such as the South Coast, a deadline of a few more years simply isn't going to do the job. There are unique conditions down there in terms of the topography and the localized meteorology which makes the problems they have especially difficult to deal with.

I think there has to be a recognition of areas that have those kinds of conditions and do everything that is possible to do.

Senator BAUCUS. Besides recognizing different areas, what else should Congress do?

Mr. THEILER. I think Congress also ought to very clearly direct EPA to promulgate certain control measures, some of them that I touched upon. In addition, Congress should very specifically mention areas that they should come up with guidance for the State to implement. There are 13 areas for reasonable available control technology guidelines, that we need Federal guidance on. It makes it almost impossible to develop individual State recommendations without that.

Senator BAUCUS. You are basically saying States want more direct guidelines and more precise standards and more direct direction?

Mr. THEILER. Exactly. That's exactly what I'm saying.

Senator BAUCUS. You want less discretion?

Mr. **Theiler**. Less discretion in terms of the areas we need to deal with. Adequate discretion to deal with localized conditions and some ability to deal with the real world but not as much discretion and not as much lack of leadership as we are getting at this time from EPA. We need stronger penalties for failure to produce.

Senator **Baucus**. Okay; we may do that.

Mr. **Theiler**. Thank you.

Senator **Baucus**. Thank you very much. The hearing is adjourned.

[Whereupon, at 11:52 a.m., the subcommittee was recessed, to reconvene at the call of the Chair.]

[Statements submitted for the record follow:]

STATEMENT OF THE HONORABLE
TIMOTHY E. WIRTH

BEFORE THE
SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

March 26, 1987

Mr. Chairman, I want to thank you for the opportunity to appear before you today as the Subcommittee begins its hearings on reducing air pollution in the nation's urban areas. This is a critically important issue to my home state of Colorado, and to the entire country.

Reducing air pollution is essential to protecting our health. Cleaning up the air is good environmental policy. And clean air makes good economic sense. Just last week, the Denver Post reported that a majority of Fortune 500 companies would not relocate a plant to an area with serious air quality problems. The President of the Denver Chamber of Commerce said that "there is a growing recognition by the business community that air quality and economic development are increasingly tied to one another."

Across the country, carbon monoxide levels exceed the federal standard in 81 urban areas. In my home state alone, Colorado Springs, Greeley, Fort Collins, and the Denver metropolitan area likely will not meet the 1988 deadline. Yet there is no doubt that the carbon monoxide pollution in these cities is a threat to our health, especially for the most vulnerable among us -- our children and the elderly.

Ozone pollution is, if anything, a more serious problem since the sources of ozone pollution are many and varied. According to the EPA, nearly 60 cities will fail to meet the federal ozone standard at the end of the year. These high pollution levels affect one out of three Americans, and there is mounting evidence that the standard needs to be tightened to adequately protect health.

In poll after poll, Americans say overwhelmingly that they want better air quality. They believe that air pollution can be reduced. And they are willing to pay for cleaner air. I agree with them.

Nevertheless, we are beginning to hear suggestions that the nonattainment problem can be solved by just relaxing the federal standards for health protection. I am confident the members of this Subcommittee will reject those proposals, as I do.

Others have suggested that we can solve the problem painlessly by simply extending the deadlines. I hope this Subcommittee will reject that advice as well.

The carbon monoxide and ozone standards were designed to protect the health of all Americans. We cannot provide one health standard for the millions of Americans who live in cities and another, more protective, standard for the rest of us.

The challenge, then, is to find a fair compromise that ensures continued progress toward clean air. I use the word "fair" because I don't believe that the imposition of sanctions across the board is the right way to go.

To be fair, a legislative solution should differentiate between those cities that submit plans that show how they will meet the standards, and those cities that don't have approved plans by the end of the year. The legislative solution should distinguish between cities that are carrying out those plans, and those which are not. And the legislation should recognize that some cities can meet the standards if we give them a little more time, but others won't be able to meet the standards in the foreseeable future.

The key to continued progress is cooperation between the federal, state, and local governments. And there certainly are actions that the Congress should take -- actions that the state and local governments can not implement without federal legislation.

Cars and trucks still are significant sources of carbon monoxide as well as the pollutants that react to form ozone. One of the first things we should do is tighten up further on tailpipe emissions from mobile sources, including trucks. It is also time to require that _all_ motor vehicles be certified at high altitudes, and at temperatures that reflect real driving conditions. This is especially important for states like Colorado, where almost all driving occurs at high elevations, and often at cold temperatures.

Many experts also have suggested that we should require auto makers to install pollution control equipment that will last for the full useful life of cars and trucks -- 100,000 miles and 10 years. I agree.

But right now, we don't even know if cars and light trucks are meeting the existing emission limits. EPA has virtually dismantled its program for randomly testing cars once they are on the road.

If EPA won't test cars on the road, at both sea level and high elevations to reflect conditions in cities like Denver, then Congress should require EPA to do it. And if we find that cars are not meeting the federal emission limits, then recalls are in order.

There are a wide range of other measures that the Congress should consider as conditions for deadline extensions. One of the most important is use of oxygenated fuels.

Mayor Pena and the State of Colorado can take pride in the fact that our state is likely to be one of the first to require regionwide use of oxygenated fuels during the winter months, when air pollution is at its worst. This is good environmental policy. And it will benefit the nation's corn growers, coal miners, and natural gas producers.

Expanded use of inspection and maintenance programs may provide additional gains in fighting air pollution.

And over the long term, increasing the use of mass transit is absolutely critical. Even though Denver will meet, or come close to meeting the ozone standard this year, the number of vehicle miles traveled is steadily increasing in Colorado. There is a real risk that Colorado could fall out of compliance as early as 1992. For cities with more serious ozone problems, the need to expand the use of mass transit is even more important. Mass transit is also vital to controlling carbon monoxide pollution, which is caused largely by cars and trucks.

I believe that Congress should give serious thought to creating a special fund to finance mass transit improvements in the nation's cities. One possibility is to increase the gasoline tax by a few cents, and to use the revenues to fight air pollution. I am sure there are other sources of revenue. But the key is making sure that cities that must expand mass transit to clean the air have the financial help they need.

Mr. Chairman, I am sure there are many other ways that the federal, state, and local governments can work together to reduce air pollution. Not all of them will work in all cities. But it is imperative that we draft legislation that ties implementation of measures that will reduce urban air pollution to extension of the attainment deadlines.

This approach is fair. Each year it will bring cities like Fort Collins, Colorado Springs, and the Denver area closer to clean air. It can be done without jeopardizing economic growth. And it will give the states the ability to avoid sanctions so long as they demonstrate consistent, real, measurable progress toward cleaner air.

I look forward to working with you, Mr. Chairman, and with the members of this Subcommittee, in making these programs work.

Testimony of the Honorable Federico Peña
Mayor of Denver, Colorado
Representing
The City & County of Denver,
The U.S. Conference of Mayors, and
The National League of Cities
Before the Hearing of the
Subcommittee on Environmental Protection,
Committee on Environment and Public Works,
U.S. Senate
on
Non-attainment Issues
March 26, 1987

I commend you, Mr. Chairman for initiating hearings on the progress of federal, state, and local governments and industry in attaining compliance with the National Ambient Air Quality Standards (NAAQS) under Clean Air Act by the statutory deadlines. Under the 1970 Act, the deadline for meeting the primary (health based) NAAQS under most of the plans was May 31, 1975. The deadline was not met in many air quality control regions. This could have effectively stopped all economic growth in many urban areas. EPA's regulatory proposals to deal with this situation were essentially adopted by Congress in the 1977 amendments. For "non-attainment areas", States were required to submit revised State Implementation Plans (SIPs) by 1979 which would provide for attainment of NAAQS in most cases by 1982. In the case of the automobile-related pollutants ozone and carbon monoxide (CO), states were allowed to apply for an extension of the deadline until December 31, 1987. This extension could be granted if it was shown that the 1982 deadline could not be met despite the application of all "reasonably available control measures" and if the revised plan satisfied eleven otehr requirements set out in the Amendments. The expectation was that there would be full attainment by now.

Clearly, that will not be the case in many cities across the nation, particularly for two of the six criteria pollutants, carbon monoxide and ozone. According to the U.S. Environmental Protection Agency, in 1984 (latest year figures were available), of the 80 largest Standard Metropolitan Statistical Areas (SMSAs) in the U.S., 70% (56 SMSAs) exceeded the Clean Air Act standards for either carbon monoxide or ozone and 30% (24 SMSAs) exceeded the standards for both Carbon Monoxide and Ozone, All 16 SMSAs with pollutants over 2 million exceeded one or both standards. However, attainment is not just a big city problem. In my home State of Colorado, besides the Denver-Boulder area, other areas of non-attainment for carbon monoxide include Colorado Springs, (population 375.000), Fort Collins (population 85,000) and Greeley (population 45,000). (See attachment I for more complete data). Approximately 61 million people now live in counties out of compliance with the carbon monoxide standard and 79 million in counties out of compliance with the ozone standard.

Because of this, air pollution continues to be a serious threat to the health of our citizens and the welfare of our communities. In Denver, every poll taken over the past five years shows air pollution to be among the top three issues facing the region. The most recent poll taken this January shows over 70% of the state population is willing to pay more to improve air quality. In Denver, air quality is not only a health issue but an economic development issue as well. A recent poll of 65 Fortune 500 companies shows that 62% say Denver's air quality would negatively effect any business location decisions they might make.

I do not believe the answer to the deadline problem is to simply extend the deadline for meeting the standards. To do so, would allow the less responsible cities and states that have not made good faith efforts to get by without even a slap on the wrist, while giving no credit to those who have made an honest attempt to purify their air. Moreover, it would make it that much harder to force compliance in the future. Drawing a line in the dirt doesn't do much good if you keep erasing it, backing up, and drawing another one.

We have to recognize that some cities simply have not exerted their best efforts. A legislative response to the deadlines must retain sanctions to ensure that these few cities get on with the difficult task of reducing air pollution. Deadline extensions should not ratify past inaction. Clearly cities should be sanctioned for failing to try, not trying and failing.

How do we address the deadline/sanction issue while preserving the primary objective of the Clean Air Act, which is to continue the progress of cities to reach attainment? I would like to make some suggestions:

First, we need to review the past actions by cities and states to reach attainment. A new test for applying sanctions needs to be developed in order to distinguish between those cities that are making a good faith effort and those that are not. The criteria should include the following:

- Has the State Implementation Plan (SIP) been approved?
- How many elements of the SIP have been implemented?
- Have additional measures been implemented that were not in the 1982 SIP? and
- What has been the response by the various jurisdictions in the area?

Cities that "fail" this new test at the end of this year should be sanctioned. They should lose a portion of the money which could be withheld, but not all of it. Cities that pass this test should not be sanctioned at the end of this year.

Deadline extensions should be granted but only with specific conditions. Guidelines for the conditions to be placed on extensions should be established by Congress. Then EPA can use the guidelines to develop specific strategies for each region. EPA should be required to report to Congress its actions on the guidelines by a specific date in order to ensure Congressional oversight. Cities would be required to implement the strategies in a timely manner. Cities actions should be reviewed annually. If a city has not acted in good faith for the first year of extension, a portion of the sanctions should be imposed. That amount should increase for each year the city fails to act responsibly.

How would this work for a city such as Denver? Denver is not now operating with an approved SIP. However, most of the strategies in the 1982 SIP have been implemented. These include:

- An inspection and maintenance program
- A voluntary no-drive campaign
- Doubling of the number of park-n-ride lots
- Freeway ramp metering
- Exclusive bus ramps
- Traffic signal improvements
- Completion of a 582 mile bicycle route network, and
- Construction of an HOV lane on South Santa Fe.

In addition to these strategies, we have implemented several others not required in the SIP. Colorado is the first state in the country to impose carbon monoxide emission standards for wood stoves. We are expanding this to cover fireplaces. By the summer, we will likely be the first state in the country to require the use of oxygenated fuels. I recently announced that City vehicles will operate on oxygenated fuels. Denver is the largest city in the country with prohibitions on wood burning on high pollution days. We are also working on measures to reduce traffic congestion and subsequently pollution in downtown Denver, such as constructing a bus lane on I-25, improving congested intersections, and improving our traffic signal technology. We are on track but we still need to implement more strategies.

If we are given 3-5 years more to reach the standard we will be successful. However, you must help us move forward by keeping the heat on us. Denver, and all cities, need our feet held to the fire. Sanctions and deadlines must be maintained.

In conclusion, the people of Denver support clean iar, and they are willing to help pay for it. They support continued efforts to meet the Clean Air Act's goals. I do not believe that cities that have made progress in reducing air pollution should be exposed to the automatic imposition of sanctions. Instead of punishing those cities that are making good efforts and are cleaning up their air, we need to work with those communities to help them to accelerate this process and continue the good efforts they are making.

I believe the suggestions I have outlined here today provide a basic framework for amending the Clean Air Act in such a way that meets these objectives. It will not weaken the act, but rather strengthen it by moving us more quickly toward attainment in Denver and the rest of the country.

Thank you, Mr. Chairman.

[ATTACHMENT TO MAYOR PENA'S STATEMENT]

AIR QUALITY PROBLEMS IN U.S. METROPOLITAN AREAS

In April 1986, the United States Environmental Protection Agency published data for 1984 (latest available year) on Carbon Monoxide and Ozone pollution levels in the nation's 80 largest standard Metropolitan Statistical Areas.

These data show that air pollution in excess of Clear Air Act standards for maximum permissible pollution levels is a pervasive problem in most SMSAs. Specifically:

* 70% (56 SMSAs) exceeded the Clean Air Act standards for _either_ Carbon Monoxide _or_ Ozone;
* 30% (24 SMSAs) exceeded the standards for _both_ Carbon Monoxide _and_ Ozone;
* 49% (39 SMSAs) exceeded the standards for Carbon Monoxide;
* 51% (41 SMSAs) exceeded the standards for Ozone.

Of the 16 SMSAs with populations over 2 million:

* 100% (16 SMSAs) exceeded the standards for _either_ Carbon Monoxide _or_ Ozone;
* 44% (7 SMSAs) exceeded the standards for _both_ Carbon Monoxide _and_ Ozone;
* 69% (11 SMSAs) exceeded the standards for Carbon Monoxide;
* 75% (12 SMSAs) exceeded the standards for Ozone.

Of the 23 SMSAs with populations between 1 million and 2 million:

* 65% (15 SMSAs) exceeded the standards for _either_ Carbon Monoxide _or_ Ozone;
* 35% (8 SMSAs) exceeded the standards for _both_ Carbon Monoxide _and_ Ozone;
* 49% (11 SMSAs) exceeded the standards for Carbon Monoxide;
* 52% (12 SMSAs) exceeded the standards for Ozone.

Of the 41 SMSAs with populations between 500 thousand and 1 million:

- 61% (25 SMSAs) exceeded the standards for either Carbon Monoxide or Ozone;
- 35% (8 SMSAs) exceeded the standards for both Carbon Monoxide and Ozone;
- 41% (17 SMSAs) exceeded the standards for Carbon Monoxide;
- 41% (17 SMSAs) exceeded the standards for Ozone.

The attached tables show the 1984 pollution levels for each of the 80 SMSAs. They are grouped in three population categories - 2 million plus, 1 million to 2 million, and 500 thousand to 1 million.

1984 Air Quality Data

SMSA	Carbon Monoxide (Standard = 9)	Ozone (Standard = 0.12)
Population: 2 Million +		
New York, NY-NJ	15*	0.17*
Los Angeles-Long Beach, CA	19*	0.29*
Chicago, IL	11*	0.15*
Philadelphia, PA-NJ	10*	0.20*
Detroit, MI	11*	0.12
San Francisco-Oakland, CA	8	0.15*
Washington, DC-MD-VA	14*	0.14*
Dallas-Fort Worth, TX	7	0.16*
Houston, TX	7	0.21*
Boston, MA	10*	0.15*
Nassau-Suffolk, NY	10*	0.10
St. Louis, MO-IL	7	0.17*
Pittsburg, PA	10*	0.11
Baltimore, MD	14*	0.15*
Minneapolis-St. Paul, MN-WI	13*	0.12
Atlanta, GA	8	0.15*

16 SMSAs total

11 (69%) over on Carbon Monoxide

12 (75%) over on Ozone

7 (44%) over on both

16 (100%) over on one or other

1984 Air Quality Data

SMSA	Carbon Monoxide (Standard = 9)	Ozone (Standard = 0.12)
Population: 1-2 Million		
Newark, NJ	18*	0.14*
Aneheim-Santa Ana-Garden Grove, CA	10*	0.26*
Cleveland, OH	7	0.14*
San Diego, CA	7	0.15*
Miami, FL	10*	0.10
Denver-Boulder, CO	20*	0.12
Seattle-Everett, WA	10*	0.09
Tampa - St. Petersburg, FL	7	0.13*
Riverside-San Bernandino-Ontario, CA	7	0.32*
Phoenix, AZ	17*	0.15*
Cincinnati, OH-KY-IN	7	0.12
Milwaukee, WI	12*	0.16*
Kansas City, MO-KS	13*	0.14*
San Jose, CA	10*	0.16*
Buffalo, NY	5	0.12
Portland, OR-WA	10*	0.13*
New Orleans, LA	9	0.12
Indianapolis, IN	9	0.12
Columbus, OH	8	0.11
San Juan, PR	7	0.08
San Antonio, TX	8	0.12

SMSA	Carbon Monoxide (Standard = 9)	Ozone (Standard = 0.12)
Population: 1-2 Million (continued)		
Ft. Lauderdale-Hollywood, FL	8	0.10
Sacramento, CA	11*	0.16*

23 SMSAs total

11 (49%) over on Carbon Monoxide

12 (52%) over on Ozone

8 (35%) over on both

15 (65%) over on one or other

1984 Air Quality Data

SMSA	Carbon Monoxide (Standard = 9)	Ozone (Standard = 0.12)
Population: 500K to 1 Million		
Rochester, NY	5	0.11
Salt Lake City-Ogden, UT	11*	0.17*
Providence-Warwick-Pawtucket, RI	11*	0.20*
Memphis, TN-AR-MS	10*	0.13*
Louisville, KY-TN	12*	0.15*
Nashville-Davidson, TN	10*	0.13*
Birmingham, AL	10*	0.11
Oklahoma City, OK	13*	0.12
Dayton, OH	7	0.12
Greensboro-Winston Salem-Highpoint, NC	11*	0.11
Norfolk-Virgina Beach-Portsmouth, VA-NC	11*	0.12
Albany-Schenectady-Troy, NY	7	0.09
Toledo, OH-MI	11*	0.11
Honolulu, HI	6	0.07
Jacksonville, FL	8	0.11
Hartford, CT	12*	0.17*
Orlando, FL	7	0.11
Tulsa, OK	7	0.13*
Akron, OH	5	0.11
Gary-Hammond-East Chicago, IN	6	0.15*

SMSA	Carbon Monoxide (Standard = 9)	Ozone (Standard = 0.12)
Population: 500K to 1 Million (continued)		
Syracuse, NY	12*	ND
Northeast Pennsylvania	7	0.11
Charlotte-Gastonia, NC	13*	0.13*
Allentown-Bethlehem-Eaton, PA-NJ	8	0.13*
Richmond, VA	7	0.13*
Grand Rapids, MI	5	0.11
New Brunswick-Perth Amboy-Sayreville, NJ	8	0.19*
West Palm Beach-Boca Raton, FL	4	0.09
Omaha, NE-IA	8	0.10
Greenville-Spartenberg, SC	ND	0.08
Jersey City, NJ	14*	0.13*
Austin, TX	ND	0.11
Youngstown-Warren, OH	5	0.09
Tucson, AZ	10*	0.11
Raleigh-Durham, NC	17*	0.10
Springfield-Chicopee-Holyoke, MA-CT	10	0.17*
Oxnard-Simi Valley-Ventura CA	5	0.16*
Wilmington, DE-NJ-MD	8	0.14*
Flint, MI	ND	0.09
Fresno, CA	14*	0.15*
Long Branch-Asbury Park, NJ	8	ND

Population: 500K to 1 Million (continued)

41 SMSAs total

17 (41%) over on Carbon Monoxide

17 (41%) over on Ozone

9 (22%) over on both

25 (61%) over on one or other

STAPPA / ALAPCO

STATE AND TERRITORIAL
AIR POLLUTION PROGRAM
ADMINISTRATORS

ASSOCIATION OF
LOCAL AIR POLLUTION
CONTROL OFFICIALS

S. WILLIAM BECKER
EXECUTIVE DIRECTOR

Testimony of

Nick Nikkila

Staff Director, Missouri Air Pollution Control Program

and

John Paul

Supervisor, Regional Air Pollution Control Agency, Dayton, Ohio

on behalf of the

State and Territorial Air Pollution Program Administrators

and the

Association of Local Air Pollution Control Officials

before the
Senate Environment and Public Works Subcommittee on
Environmental Protection

March 26, 1987

NORTH CAPITOL ST N.W. WASHINGTON D.C 20001

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March 26, 1987

Mr. Chairman and Members of the Subcommittee, my name is Nick Nikkila, and I am the Staff Director of the Missouri Air Pollution Control Program. I appear here today on behalf of the State and Territorial Air Pollution Program Administrators (STAPPA), of which I am Vice-President. Accompanying me today is John Paul, Supervisor of the Regional Air Pollution Control Agency in Dayton, Ohio. Mr. Paul is the Vice-President of the Association of Local Air Pollution Control Officials (ALAPCO) and Chair of the association's Ozone Task Force.

STAPPA and ALAPCO are the national associations of air pollution control agencies in the 54 states and territories and more than 150 major metropolitan areas across the country.

The associations' members have primary responsibility for implementing our nation's air pollution control laws and regulations and ensuring healthy air quality for our citizens. We appreciate this opportunity to present the views of STAPPA and ALAPCO on the problems state and local air pollution control agencies are experiencing in attempting to attain the National Ambient Air Quality Standards for ozone and carbon monoxide, and our recommendations for addressing these problems.

According to EPA, more than 70 major metropolitan areas in 40 states are not expected to attain the National Ambient Air Quality Standard for ozone by the congressionally-mandated December 31, 1987 deadline. In addition, as many as 80 areas in 42 states may not reach the carbon monoxide standard by the deadline. STAPPA and ALAPCO are deeply concerned with the serious health consequences resulting from exceedances of these standards.

There is strong scientific evidence that exposure to ozone at concentrations at or above the existing health-based federal standard (0.12 parts per million) adversely affects public health. Moreover, of the 80 million people residing in nonattainment areas, no sector appears to be totally immune. According to the Environmental Protection Agency, healthy individuals who are exercising while ozone levels are at or slightly above the standard can experience "reduced functioning of the lungs," which can lead to "chest pain, coughing, wheezing, pulmonary and nasal congestion, labored breathing, sore throat, nausea, and faster respiratory rate." The agency also found that children exposed to ozone conditions "not unlike conditions in major urban areas during the summer" experienced decrements to lung function which persisted for many days after the ozone episode passed. Additionally, animal toxicity studies reveal that "ozone initiates damage to sensitive lung tissue, and that damage continues for some time after ozone exposure has ended." If the exposure is repeated over long periods of time, permanent lung damage may result. Finally, animal studies also show that even ozone concentrations of 0.08 ppm, which are below the current standard, result in "increased susceptibility to acute respiratory infection."

Exposure to unhealthful levels of carbon monoxide also presents a serious threat to millions of individuals living or working in our major cities. Carbon monoxide, when inhaled, enters the bloodstream and disrupts the delivery of oxygen to the body's tissues. According to EPA, "those most sensitive to this effect are the estimated nine million people with cardiovascular disease, particularly those with angina or peripheral vascular disease. Their conditions are aggravated when CO acts on the blood supply to form harmful levels of blood carboxyhemoglobin." In addition, EPA has concluded that exposure to low levels of carbon monoxide not only affects "aerobic capacity, visual perception, manual dexterity and learning ability," but may also harm fetuses.

The Clean Air Act, adopted in 1970 and last amended in 1977, establishes the regulatory framework for addressing these health problems. The act delegates primary responsibility for air pollution control to state and local governments, but also acknowledges that "federal financial assistance and leadership is essential...." For the Clean Air Act to successfully achieve its goal, a continuing cooperative relationship between all levels of government is extremely important.

Under the act, each level of government has been delegated specific responsibilities by Congress. EPA is required to set national health-based standards (e.g., for ozone and carbon monoxide), develop minimum technology requirements for industry (e.g., New Source Performance Standards), approve state plans and oversee their implementation, carry out the Federal Motor Vehicle Control Program, conduct research and provide funding to state and local agencies to operate their programs.

State and local agencies, in turn, are responsible for utilizing the tools EPA provides (e.g., technical assistance, research and funding) in order to develop regulatory strategies for controlling air pollution. Our agencies must prepare plans, adopt and enforce regulations, issue permits, inspect facilities and monitor the ambient air to ensure that we are making steady progress.

EPA and state and local air pollution control agencies are making progress in controlling ozone and carbon monoxide under the Clean Air Act. For example, according to a recent EPA report, the estimated number of exceedances of the ozone standard decreased by 36 percent between 1979 and 1984 ("Progress in the Prevention and Control of Air Pollution in 1985"). EPA adds that "this occurred despite an estimated national growth of almost 200 billion vehicle miles of travel between 1980 and 1984 and an expansion of economic activity in 1984."

We are also reducing carbon monoxide levels. According to the same EPA report, carbon monoxide emissions decreased 14 percent between 1975 and 1984. Again, this progress occurred at the same time motor vehicle transportation increased significantly.

Unfortunately, despite our efforts, we have fallen short in our quest for clean air. Most major metropolitan areas are not expected to attain the National Ambient Air Quality Standards for ozone and carbon monoxide and for some, attainment may be several decades away.

Several factors have contributed to this dilemma.

With respect to ozone, some state and local air pollution control agencies have not submitted adequate State Implementation Plans or implemented their SIP commitments in an optimum manner. According to EPA's most recent audit of state and local programs, while most agencies received "high marks" on implementing their programs, several problems still exist, including 1) outdated or inoperative monitoring equipment, 2) incomplete area source and mobile source emissions inventories, 3) delays in submitting SIP revisions, 4) difficulties in implementing vehicle Inspection and Maintenance programs and 5) inadequate data systems and incomplete inspection reports in the enforcement program.

Many of these implementation problems have been due to a lack of resources. The development and implementation of ozone State Implementation Plans (SIPs) have been extremely ambitious tasks requiring substantial resources. As federal funds (which comprise one-third of agencies' budgets) have decreased in recent years, state and local agencies have been required, nonetheless, to fulfill their responsibility of regulating hundreds (sometimes thousands) of industrial facilities in a short period of time. Agencies must continue to upgrade monitoring networks, develop emissions tracking systems, improve the effectiveness of vehicle Inspection and Maintenance programs and enhance enforcement programs by conducting more frequent inspections of a greater number of facilities. We simply can not perform these tasks without adequate staff and resources.

Second, ozone formation is an extremely complex and poorly understood process. Because of problems encountered with EPA's mathematical models, many nonattainment areas that anticipated attaining the ozone standard by December 31, 1987, underestimated the hydrocarbon reductions necessary to reach attainment. Models such as EKMA--the Empirical Kinetic Modeling Approach--on which state and local agencies relied in 1982 to project attainment by 1987, have underpredicted by 30 percent or more the amount of stationary source reductions needed to attain the ozone standard. Similarly, EPA's mobile source models--Mobile 2, 3 and 4--have been overly optimistic in their projections. Today, in-use vehicle emissions are significantly higher than the models predicted, further contributing to the failure of many areas to attain the standard.

A third reason for continued nonattainment relates to the transport of ozone and its precursors, hydrocarbons and nitrogen oxides. Many areas of the country with EPA-approved State Implementation Plans, including much of the northeast, actually monitor high levels of ozone (at times, in excess of the standard) entering their states. In many cases, the ability of individual states to effectively address their ozone problem is impaired by existing law requiring the identification of specific sources (as opposed to regions) outside the area that contribute, via transport, to nonattainment. The regional nature of the transport problem makes such specific source identification extremely difficult, if not impossible. Consequently, regardless of the controls required within a nonattainment area, the lack of controls in regions that impact that nonattainment area will severely undermine all efforts to achieve the standard.

Finally, many areas have not been able to attain the ozone standard because of their inability to regulate facilities other than those for which EPA defines "Reasonably Available Control Technology" (RACT). Until 1984, it was a common practice for EPA to define RACT by publishing Control Technique Guideline (CTG) documents. State and local agencies could use CTGs quite effectively in imposing RACT requirements on industry. However, over the past three years, EPA has not published a single CTG, making it extremely difficult for many states to require controls on industries that heretofore have been unregulated.

With respect to nonattainment of the carbon monoxide standard, which is predominantly a mobile source problem, several factors play contributing roles. Perhaps the most significant is that motor vehicle performance in the "real world"--where vehicles are often tampered with and improperly maintained--can differ greatly from performance under EPA certification conditions, where vehicles are carefully controlled. Additionally, in some cases, vehicle Inspection and Maintenance programs are failing to meet our expectations.

STAPPA and ALAPCO are pleased that this committee is considering amendments to the Clean Air Act. We believe amendments to the act are sorely needed and urge that you take swift action. In amending the act, we recommend that you not only include provisions for addressing the ozone and carbon monoxide nonattainment problems, but adopt substantive measures for other areas as well. However, since the focus of this hearing is on ozone and carbon monoxide, we will limit our comments today to these issues.

Before describing the STAPPA/ALAPCO ozone control strategy, we wish to make a few general obervations about the ozone and carbon monoxide provisions of the Clean Air Act.

STAPPA and ALAPCO believe the current nonattainment program in the Clean Air Act is effective and does not require major revisions. The act's provisions establishing deadlines and imposing sanctions for not making good-faith efforts to meet these deadlines are important components of the law, as are specific identification of national controls, such as the motor vehicle control program, and requirements mandating implementation at the federal level. In addition, we have found one of the most successful aspects of the air pollution control program to be the process in which EPA defines appropriate control technologies, such as New Source Performance Standards (for new facilities) and Reasonably Available Control Technology (for existing facilities), and state and local agencies implement these requirements. We believe these features should be retained in the act.

However, the implementation plan process is one component of the act that does require major revision. The planning requirements in the Clean Air Act create a complex process involving imprecise mathematical modeling that has drained our resources away from the real objective of controlling air pollution. Moreover, the federal process for approving these plans has become so time-consuming that it has delayed progress.

STAPPA and ALAPCO have recently adopted an ozone control strategy, which we will summarize below. We have also attached a copy to our testimony. While the associations are not now suggesting a specific strategy for controlling carbon monoxide, we note that many of our ozone control recommendations will result in significant reductions in carbon monoxide emissions.

The STAPPA/ALAPCO ozone control strategy is based upon the premise that, while we have made progress in the past in controlling ozone, we must continue to seek reductions in ozone precursors by improving our existing regulatory programs and further controlling stationary and mobile sources. We believe that the control measures embodied in our recommendations could bring most areas of the country into attainment within the next five years and, at the same time, set the more severely polluted areas on a rigid course for achieving reasonable further progress until they eventually attain the standard.

The STAPPA/ALAPCO strategy classifies all areas of the country into three categories--attainment, moderate nonattainment and severe nonattainment--and requires specific sets of control measures that areas will have to adopt, based upon their classification. For each category, we have recommended that the stringency of control requirements increase in proportion to the severity of the ozone problem.

Attainment areas unable to demonstrate that they do not contribute to nonattainment of the ozone standard in another area would be required to adopt a minimum set of control requirements, including the application of "Reasonably Available Control Technology" on a number of existing industries that previously have been unregulated. We believe Congress should require EPA to define RACT within two years for the individual categories identified in our strategy and suggest that contingency requirements be included in the event that EPA fails to comply.

Moderate nonattainment areas would be required to adopt, in addition to the measures required for attainment areas, a more stringent set of controls, including enhanced new source review requirements. These areas would be required to attain the ozone standard by December 31, 1992.

All areas classified as severe nonattainment areas, including those moderate nonattainment areas that do not attain the standard by 1992, must implement a more rigorous set of control requirements. In addition to the above measures, these areas would be required to regulate a larger number of smaller facilities--old and new--and set emission caps on existing industrial operations. Severe nonattainment areas would also be required to make steady progress toward attainment by committing to a specified percent reduction in emissions from their 1987 levels. Moreover, nonattainment areas unable to meet the ozone standard by 1997 must develop a plan demonstrating attainment by a specified deadline (which may vary from area to area), and continue to commit to reductions in emissions until they attain the standard.

We are also suggesting several additional provisions in our ozone control strategy.

First, we believe it is important that we obtain the maximum benefits of ozone control measures currently in place. Presently, we are working cooperatively with EPA through the National Air Audit System to identify and correct deficiencies in existing programs. To complement this effort, it will also be necessary to upgrade outdated federal requirements. Most of the existing

Control Technique Guideline documents (Groups I and II) were published between 1976 and 1978 and do not reflect current state-of-the-art technology. Additionally, some New Source Performance Standards may need to be revised.

Second, STAPPA and ALAPCO recommend that Congress require EPA to develop and implement a set of federal control measures (e.g., volatility and onboard controls), which, like the motor vehicle program, should be applicable nationwide. We have identified these measures in our strategy. The associations believe it is essential that EPA implement these measures on the federal level since they affect products that are manufactured and marketed regionally and nationally, rather than by individual states. We also recommend that the existing motor vehicle emission standards be tightened in order to reflect the latest technological advances.

Third, STAPPA and ALAPCO recommend that regulation of new sources apply to all facilities emitting 50 or more tons per year of ozone precursors, a decrease from the current regulatory level of 100 tons per year. We believe that, at a minimum, all new sources should install the Best Available Control Technology (BACT) and not be allowed to escape new source review requirements.

Fourth, the STAPPA/ALAPCO ozone control strategy clarifies the role of sanctions and recommends that they be imposed for failing to implement appropriate measures, rather than for failing to attain the standards. While we support most of the sanctions currently available under the Clean Air Act, we question the need to withhold sewage treatment grants since these funds are no longer eligible for growth.

Finally, STAPPA and ALAPCO recommend that a comprehensive ozone study be conducted and completed by 1992. The study should 1) examine the role of nitrogen oxides (NO_x) and the effect of NO_x controls, 2) quantify the problem of transport of ozone and ozone precursors, and 3) quantify the relationship between ozone precursor emissions, ambient precursor levels and ozone concentrations.

In summary, STAPPA and ALAPCO recommend that Congress substitute a technology-based strategy for the modeling-based planning approach that currently exists in the Clean Air Act. Areas should be classified according to the severity of their ozone problem and specific sets of requirements should be mandated for each classification. We believe that such an approach would allow available resources to be focused directly on the implementation and enforcement of control strategies and lead to expeditious attainment of the ozone standard.

We appreciate this opportunity to testify and will be happy to answer any of your questions.

STAPPA/ALAPCO OZONE CONTROL STRATEGY

	ATTAINMENT AREAS	MODERATE NONATTAINMENT AREAS	SEVERE NONATTAINMENT AREAS
GEOGRAPHIC COVERAGE	All areas meeting the National Ambient Air Quality Standard for ozone.	All nonattainment areas (as of January 1, 1988) below a design value of 0.18 ppm (based upon 1985-1987 data), with the exception that some areas (below 0.18 ppm) experiencing a large number of exceedances may not qualify as "moderate."	All nonattainment areas (as of January 1, 1988) above a design value of 0.18 ppm (based upon 1985-1987 data), plus other nonattainment areas (below 0.18 ppm) with a large number of exceedances. All areas that do not attain the standard by December 31, 1992 will be classified as "severe."
DEADLINES/SANCTIONS	Areas must comply with all requirements identified below. Sanctions imposed only for failing to implement the identified measures.	Areas must comply with all requirements identified below and attain by 1992, or meet requirements for Severe Nonattainment Areas. Sanctions imposed only for failing to implement the identified measures.	Areas must comply with all requirements identified below. If attainment is not reached by 1997, the area must submit a plan demonstrating attainment by a specific date. Areas must meet specific percent reductions from 1987 emissions every five years. Sanctions imposed only for failing to implement the identified measures.

	ATTAINMENT AREAS	MODERATE NONATTAINMENT AREAS	SEVERE NONATTAINMENT AREAS
REQUIREMENTS FOR EXISTING SOURCES (DUAL SOURCE DEFINITION)			
A. CONTROLS	Reasonably Available Control Technology (RACT), unless a demonstration can be made that the area does not contribute to non-attainment	Reasonably Available Control Technology	Reasonably Available Control Technology
B. SOURCE APPLICABILITY	Sources emitting 50 tons or more per year (allowable) of volatile organic compounds (VOCs)	Sources emitting 50 tpy or more (allowable) of VOCs	Until 1992, sources emitting 50 tpy or more (allowable) of VOCs; after 1992, sources emitting 25 tpy or more
C. INDUSTRIES AFFECTED	Industrial Categories (I-III) for which Control Technique Guidelines currently exist. Additionally, EPA must define RACT within two years and areas must implement those measures for the following industries: Stage II Vapor Recovery Wood Furniture Coating Autobody Refinishing Metal Rolling SOCMI Distillation SOCMI Batch Process Coke Oven By-Product Plants Treatment, Storage and Disposal Facilities Bakeries Sewage Treatment Plants Web Offset Lithography Plastic Parts Coating Additional Categories as identified under California REEP	Same as Attainment Areas	Same as Attainment Areas
D. BUBBLING	Allowed at 1:1 ratio	Allowed at greater than 1.1 ratio	Prohibited
E. EMISSION CAPS	Not required	Not Required	Required, based on historical operating rates

	ATTAINMENT AREAS	MODERATE NONATTAINMENT AREAS	SEVERE NONATTAINMENT AREAS
REQUIREMENTS FOR NEW SOURCES (DUAL SOURCE DEFINITION)			
A. CONTROLS	Best Available Control Technology (BACT)	Lowest Achievable Emission Rate (LAER)	Lowest Achievable Emission Rate and Best Available Control Technology
B. SOURCE APPLICABILITY	New sources emitting 50 tpy or more (allowable) of VOCs; major modifications -- 20 tpy or more	New sources emitting 50 tpy or more VOCs; major modifications -- 20 tpy or more	LAER required for new sources emitting 50 tpy or more and for major modifications 20 tpy or more; BACT required for new sources less than 50 tpy.
C. OFFSETS	Not required	Required at greater than 1:1 for new sources emitting more than 50 tpy and for major modifications more than 20 tpy.	Required at greater than 1:1 for new sources emitting more than 50 tpy and for major modifications more than 20 tpy.
D. NEW SOURCE NETTING	Prohibited	Prohibited	Prohibited
MEET EXTENSION AREA REQUIREMENTS	Not required	Required	Required
VEHICLE INSPECTION AND MAINTENANCE	Not required	Full component and/or tailpipe	Enhanced I/M; expansion to CMSA (with opt-out provision)

FEDERAL CONTROL MEASURES	
A. GEOGRAPHIC COVERAGE	Nationwide, regardless of attainment status.
B. STATIONARY SOURCE CONTROLS	Commercial/Consumer Solvents Architectural Coatings Pesticide Application Traffic Coatings Military Specification Coatings
C. MOTOR VEHICLE CONTROLS	Onboard Controls Gasoline Volatility Controls (9 psi) Motor Vehicle Emission Standards: Light Duty Vehicles (1992): 0.25 ppm (HC), 3.4 ppm (CO), 0.4 ppm (NO_x) Light Duty Trucks (1994): Proportional Decreases Heavy Duty Trucks (1994): Proportional Decreases
MAXIMIZE EFFECTIVENESS OF EXISTING RULES	Required for Attainment, Moderate Nonattainment and Severe Nonattainment Areas: • Eliminate deficiencies in state and local programs. • Upgrade federal requirements, including NSPS and CTGs. • Conduct greater surveillance and enforcement of the federal mobile source control program. • Update compliance procedures for federal motor vehicle control programs. • Implement short (idle) tests as part of the Federal Test Procedure and assembly line audit procedures.
STUDY PROVISION	Comprehensive ozone study completed by 1992 designed to: • Determine the role of nitrogen oxides (NO_x) and the effect of NO_x controls. • Quantify the transport of ozone and ozone precursors. • Examine the relationship between ozone precursor emissions, ambient precursor levels and ozone concentrations.

STAPPA / ALAPCO

STATE AND TERRITORIAL
AIR POLLUTION PROGRAM
ADMINISTRATORS

ASSOCIATION OF
LOCAL AIR POLLUTION
CONTROL OFFICIALS

S. WILLIAM BECKER
EXECUTIVE DIRECTOR

February 10, 1987

Honorable John D. Dingell
Chairman
Subcommittee on Oversight and Investigations
House Energy and Commerce Committee
2323 Rayburn House Office Building
Washington, DC 20515

Dear Congressman Dingell:

On behalf of the State and Territorial Air Pollution Program Administrators (STAPPA) and the Association of Local Air Pollution Control Officials (ALAPCO), we thank you for your January 2, 1987 letter soliciting the views of the associations on the problem of ozone nonattainment. STAPPA is the national association of state air pollution control officials in the 54 states and territories. ALAPCO is the national association of local air pollution control officials representing over 150 major metropolitan areas throughout the country. STAPPA and ALAPCO appreciate your interest in this important health issue and are pleased that your Subcommittee is conducting an investigation. We are enclosing a copy of the draft "STAPPA/ALAPCO Ozone Control Policy" jointly adopted by the associations and will forward to you the final policy as it is refined in the next six weeks.

We wish to comment specifically on the issues you raise in your letter.

On the first page of your letter, you refer to Part I of the draft STAPPA/ALAPCO strategy and note that it requires that deficiencies in existing local, state and federal programs be corrected. While this statement is correct, it does not totally reflect all of the recommendations that we are suggesting in Part I.

Part I of the draft STAPPA/ALAPCO strategy is designed to maximize the effectiveness of local, state and federal ozone control measures developed under the existing clean air program. We believe that it is not only important to examine new stationary and mobile source control measures that should be implemented

-- as our strategy suggests in Parts II and III -- but also to ensure that existing programs are working as effectively as possible. This can be accomplished in several ways. Clearly, one way is to identify and correct deficiencies in the existing programs.

In an attempt to identify deficiencies in existing air programs, STAPPA, ALAPCO and EPA developed the National Air Audit System in 1983 to ensure that "state and local air pollution control programs were operating in such a manner as to satisfy the national requirements of the Clean Air Act." Since FY 1984, EPA has audited the performance of state and local agencies annually. According to EPA's most recently published report (FY 1985), the agency concluded that state and local air pollution control agencies get "high marks" on implementing their programs; however, EPA did identify several problem areas existing in some states, including:

- outdated or inoperative monitoring equipment;
- incomplete area source and mobile source emissions inventories;
- difficulties in implementing EPA modeling guidance;
- delays in submitting SIP revisions;
- difficulties in implementing vehicle Inspection/Maintenance programs; and
- inadequate data systems and incomplete inspection reports in the enforcement program.

We are working very closely with EPA to correct these problems. Each year, in its federal grant negotiations with state and local agencies, EPA requires that these agencies make specific commitments to ameliorate deficiencies identified in the most recent audits. During FY 1986, for instance, the state of Michigan increased its inspection frequency percentage, a specific deficiency identified in the FY 1985 audit.

While it is important to correct these program deficiencies -- and, as we indicated, they are being addressed -- some corrections will yield greater environmental benefits than others. For example, STAPPA and ALAPCO have recommended in Part I of their strategy that EPA set a gasoline volatility limit of nine pounds per square inch (psi). Although all SIPs are based upon 9 psi, the volatility of gasoline has increased to much higher levels over the past few years, resulting in unexpected increases in ozone precursors. Additionally, the associations have recommended that federal measures be upgradad, including previously promulgated Control Technique Guideline documents and New Source Performance Standards. Many CTGs and NSPS, which were promulgated over five years ago, are out of date and should be strengthened. Finally, STAPPA and ALAPCO believe that the effectiveness of local, state and federal air pollution control programs can be maximized if EPA (1) conducts greater surveillance and enforcement of the federal motor vehicle control program (by eliminating loopholes and resolving ambiguities), (2) updates compliance procedures for the motor vehicle program (to ensure that vehicles perform as cleanly in practice as they do under the Federal Test Procedure), and (3) implements the short idle test as part of the Federal Test Procedure and assembly line audit procedures.

On page two of your letter, you refer to STAPPA and ALAPCO's criticism of EPA in failing to develop an ozone control policy in a timely manner. We believe that our criticism is warranted.

EPA has been developing an ozone control strategy for two years and still does not appear to be close to publishing even a proposed strategy. The December 31, 1987 ozone attainment deadline is rapidly approaching and state and local agencies depend upon the policy guidance and technical information from EPA in reaching attainment. In addition, given the EPA General Counsel's recent legal opinion, it is possible that sanctions will be imposed in areas that fail to achieve the standard and will remain in effect until attainment is reached.

STAPPA and ALAPCO believe that if EPA had published its ozone control strategy -- as it promised last year -- and committed to the kinds of federal stationary and mobile source measures that it is still only "considering," attainment of the ozone standard by the December 31, 1987 deadline would not elude so many of the projected post-1987 nonattainment areas.

For example, we have found that the ability of some states to control evaporative emissions through Stage II Vapor Recovery and by limiting volatility may actually determine whether or not the region attains the ozone standard by the deadline. Consequently, for over five years, both STAPPA and ALAPCO have urged EPA to publish technology guidance defining "Reasonably Available Control Technology" for Stage II Vapor Recovery and have recommended that the agency set a summertime volatility limit on gasoline. However, despite many promises, EPA has not taken any action. As a result, most states have not adopted Stage II Vapor Recovery because they are either awaiting a decision by EPA (which has been promised since 1985) and/or are precluded by state law (e.g., Maryland and Illinois) from adopting regulations more stringent than those set by EPA. With respect to volatility, it is extremely difficult for states to regulate the volatility of gasoline because it is produced and marketed on a regional basis, rather than by individual states. Until EPA makes these and other decisions, most state and local agencies will be unable to avail themselves of these necessary ozone control strategies.

Regarding your statements on page four of your letter, we wish to provide several clarifications.

You correctly indicate that "SIPs are supposed to provide for attainment by the deadline at the end of this year, not one day later" [emphasis added]. While as many as 70 areas may not reach attainment by the end of this year, most of these SIPs had indeed "provided" for attainment. Unfortunately, what was provided for in 1982 -- when SIPs were submitted -- was not, in many cases, fully achieved. There are four major reasons for this, including (1) inadequate resources, (2) poor understanding of the science of ozone formation, (3) interstate transport and (4) the failure of EPA to provide guidance to achieve additional reductions.

- Inadequate Resources

  The development and implementation of ozone State Implementation Plans (SIPs) have been extremely ambitious tasks requiring substantial resources. As federal funds (which comprise one-third of agencies' budgets) have decreased, state and local agencies have been required, nonetheless, to fulfill their responsibilities by regulating hundreds (sometimes thousands) of industrial facilities in a short period of time. Agencies must continue to upgrade monitoring networks, develop emissions tracking systems, improve the effectiveness of vehicle inspection and maintenance programs and enhance enforcement programs by conducting more frequent inspections of a greater number of facilities. The difficulty many of these areas have experienced in achieving their anticipated reductions has not been due to a lack of will, but rather the lack of adequate staff and resources to perform these tasks.

- Poor Understanding of the Science of Ozone Formation

  The science of ozone formation is complex and poorly understood. Many nonattainment areas that had provided for attainment by December 31, 1987 underestimated the necessary hydrocarbon reductions required to reach attainment because of problems encountered with EPA's mathematical models. Models, such as EKMA (Empirical Kinetic Modeling Approach), on which state and local agencies relied in 1982 to project attainment by 1987, have underpredicted by 30 percent or more the amount of reductions needed to attain the standard. Similarly, EPA's mobile source models -- Mobile 2, 3 and 4 -- have been overzealous in their predictions. Today, in-use vehicle emissions are significantly higher than what the models predicted, further contributing to the failure of many areas to reach attainment.

- Interstate Transport

  Transport of ozone and its precursors (hydrocarbons and nitrogen oxides) is a significant problem causing or exacerbating ozone nonattainment. For example, many areas with approved SIPs providing for attainment are actually monitoring high levels of ozone (at times, in excess of the standard) entering their states. Due to the regional nature of the problem, it is extremely difficult to ascertain the specific sources contributing to nonattainment, and therefore difficult for individual states to take appropriate actions under the existing ozone control program. EPA, to date, has failed to adequately address this issue. Consequently, regardless of what controls these areas require in their regions, they still will be considered nonattainment.

- Lack of EPA Guidance

  Many areas have not been able to reach attainment because of their inability to regulate facilities other than those for which EPA defines "Reasonable Available Control Technology" (RACT). Unfortunately, for the past several years, the agency has been unwilling to issue technology guidance defining RACT. In addition to Stage II Vapor Recovery, EPA should be publishing technology guidance for many industrial categories that have previously been unregulated. These include, among others, architectural coating, autobody refinishing and clean-up solvents. As part of your oversight and investigation, we urge you to determine why EPA has stopped issuing this guidance for state and local agencies.

You also indicate on page four of your letter that since Section 101 of the Clean Air Act specifies that "the prevention and control of air pollution at its source is the primary responsibility of States and local governments," these governments are now required to meet SIP commitments "with or without EPA's 'assistance and leadership.'" Yet, we note another Congressional finding in Section 101 that states "that Federal financial assistance and leadership is essential for the development of cooperative Federal, State, regional and local programs to prevent and control air pollution" [emphasis added].

What Congress determined in 1970, when it enacted the Clean Air Act, is equally relevant today -- i.e., the success of our nation's air quality control program is dependent upon a cooperative effort by all levels of government. If one level of government fails to exert its leadership and implement its responsibilities, the program will fail.

State and local agencies have accepted the responsibility of implementing their SIP commitments in an effort to attain the ozone standard by December 31, 1987, notwithstanding the fact that "Federal financial assistance and leadership" -- which Congress acknowledged is "essential" to a successful program -- has diminished in recent years.

You also conclude that Parts I and III of STAPPA and ALAPCO's ozone control strategy "seem to coincide nicely with the existing requirements of the law...." While we agree that Part I of our policy is consistent with existing legislation, it appears that Part III may require changes to the Clean Air Act.

Part III of the STAPPA and ALAPCO ozone policy specifies the control requirements that state and local agencies must adopt, depending upon the severity of their ozone problem.

For all areas, including those attaining the ozone standard, the associations recommend the adoption of Reasonably Available Control Technology on existing sources (not subject to NSPS or NESHAPS) above de minimis levels. While this requirement is a departure from the existing Clean Air Act, it was adopted to acknowledge the fact that although an area may itself have attained the ozone standard, it may, nonetheless, be contributing significantly to the nonattainment problems of other areas through ozone transport.

In addition, for moderately polluted areas (i.e., below a specified threshold), we urge that Part I (maximizing the effectiveness of existing programs) and Part II (new federal control measures and guidance) be implemented. STAPPA and ALAPCO believe that areas with "moderate" ozone problems should be able to attain the standard within a relatively short period of time (i.e., three to five years). The associations also believe that the measures necessary for attainment are commercially available and should be identified as RACT by EPA. However, if EPA does not commit on its own to defining these measures as RACT, then the agency should be required to do so by Congress.

Finally, for the most severely polluted areas (i.e., above a specified threshold), we recommend additional requirements, which could necessitate amending the Clean Air Act. These include (1) the adoption of "Best Available Retrofit Technology" for all existing facilities, (2) the prohibition of bubbling/netting, (3) a more aggressive offset policy and (4) the establishment of emission caps based upon historical operating rates.

Since it is clear that these severely polluted areas will not attain the ozone standard in the near future, it is necessary to require strict control measures (e.g., BART) and continued emission reductions as these areas strive for attainment.

Additionally, STAPPA and ALAPCO are recommending several measures concerning the siting of new sources. Specifically, we believe that New Source Review rules should be revised to require that:

- the applicability definition for major sources be set at 50 tons per year;
- the dual source definition be reinstituted; and
- offsets be required for new major sources in all nonattainment areas.

These rule changes are necessary to ensure controlled growth in the future. Section 166 of the Clean Air Act requires EPA to regulate growth in attainment areas by promulgating regulations for the Prevention of Significant Deterioration (PSD) for Set II pollutants, including ozone and its precursors. However, the agency has never implemented this program.

When referring to Part II of our strategy, you "question the need for such Federal controls and guidance or their usefulness at this late date," and conclude that "clearly, they will not help to meet the December 31, 1987 deadline."

Our primary responsibility as state and local air pollution control officials is to provide clean and healthy air as expeditiously as possible. We have implemented the Clean Air Act as best we can, given the limited resources and technical assistance, and will continue to do so. We truly believe, however, that had the federal government carried out its responsibilities, many more areas of the country would be able to attain the ozone standard by December 31, 1987. Even though federal actions now may be too late to help most areas meet the December 31, 1987 deadline, our responsibility for reaching attainment continues. Thus, we continue to call for the requisite federal controls and guidance.

You also express concern that the STAPPA and ALAPCO proposal "seems to shift the burden of controls from State and local governments to Congress and EPA...." We do not share this view. As we indicated previously, the Clean Air Act calls for a cooperative effort by all levels of government and recognizes that federal leadership is "essential." We expect EPA to provide this leadership. One way that EPA can demonstrate leadership is to provide technical guidance. This is important for several reasons.

First, until five years ago, it was a common practice for EPA to publish CTGs. State and local agencies were familiar with these guidelines and could use them quite effectively in defining RACT requirements for industry. However, more recently, EPA has not published a single CTG, making it nearly impossible for many states to regulate industries that heretofore have been unregulated. Second, it is far more cost-effective for one agency -- EPA -- to develop this technology guidance than it is for each state and local agency to develop the guidance on its own. We also fail to see how EPA would require more resources and time to develop guidance at the federal level than at the state and local levels, as you suggest. Third, when EPA develops the technological guidance, the resultant requirements are consistent (not identical) throughout the country, a practice favored not only by state and local air pollution control agencies but also by many industries as well. Finally, many of the decisions we are asking EPA to make are for industrial practices that can not easily be regulated state-by-state. For example, as we mentioned earlier, it is extremely difficult for individual states to set their own gasoline volatility limits. Additionally, it is equally difficult for individual states to adopt their own architectural coating requirements. These types of decisions are clearly ones that should be made at the federal level.

On page five of your letter, you ask us whether we intend the federal controls and guidance "to apply only to the ozone nonattainment areas and not to the entire Nation and whether such a limited application is possible under the law."

As you may note from our letter, the draft STAPPA/ALAPCO Ozone Control Policy affects almost all areas of the country. To the extent that our recommendations are not consistent with the Clean Air Act, we suggest that Congress amend the legislation.

With respect to your comments on modeling, STAPPA and ALAPCO believe that our knowledge of atmospheric chemistry, the effects of transport, meteorological conditions and other parameters is not precise enough to derive clear quantitative conclusions about the amount of control needed. While models should not be used to escape control requirements, specific models refined for particular regional airsheds may be useful to compare control alternatives.

In the closing paragraph of your letter, you note that the severity of the ozone nonattainment problem varies among the estimated 73 ozone nonattainment areas and that not all of these areas present the same risks. We agree with this statement (as demonstrated by our strategy) and believe that you have appropriately directed this issue to EPA. We will be interested in the agency's response.

In conclusion, we appreciate your interest in soliciting the views of STAPPA and ALAPCO. If you seek additional information, please do not hesitate to contact either of us or STAPPA and ALAPCO's Executive Director, S. William Becker.

Sincerely,

Donald Moline
Donald Moline
President of ALAPCO

Robert Miller
Robert Miller
President of STAPPA

Enclosure

cc: Congressman Norman F. Lent, Ranking Minority Member
Subcommittee on Oversight and Investigations

Congressman Henry A. Waxman, Chairman
Subcommittee on Health and the Environment

Congressman Edward R. Madigan, Ranking Minority Member
Subcommittee on Health and the Environment

Lee M. Thomas, Administrator
Environmental Protection Agency

Francis S. Blake, General Counsel
Environmental Protection Agency

J. Craig Potter, Assistant Administrator for Air and Radiation
Environmental Protection Agency

Charles A. Bowsher, Comptroller General
General Accounting Office

Governor Bill Clinton, Chairman
National Goverors' Association

Governor James J. Blanchard
State of Michigan

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CHIEF COUNSEL/STAFF DIRECTOR

U.S. House of Representatives
Subcommittee on Oversight and Investigations
of the
Committee on Energy and Commerce
Washington, DC 20515

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January 2, 1987

Honorable Robert F. Miller
President
State and Territorial Air Pollution
  Program Administrators and
Chief of Air Quality Division
Department of Natural Resources
P. O. Box 30028
Lansing, Michigan 48909

Dear Mr. Miller:

Congratulations on your election as President of the State and Territorial Air Pollution Program Administrators (STAPPA). I look forward to working with you.

As you know, the Subcommittee, with the help of the General Accounting Office (GAO), is investigating issues relating to ozone attainment under the Clean Air Act which is why I am writing you.

Enclosed for your information is a copy of my most recent letter to the Environmental Protection Agency (EPA) concerning the EPA ozone policy and activities and related matters. I understand that your Executive Director, Mr. S. William Becker, and my staff had a recent discussion about these matters which are of great concern to the Subcommittee and myself. My staff has provided Mr. Becker with copies of earlier exchanges of letters with EPA concerning these matters. The discussions apparently were helpful and I hope that they continue.

Since those discussions, I reviewed an article in the December 26, 1986 Environment Reporter which states that STAPPA has developed a new three part ozone strategy. The article describes the first part of your strategy as requiring that "deficiencies in existing local, state, and federal programs" should be corrected. The article does not explain what those deficiencies are, when they were first observed, their present status, or whether they are identical in all areas and States. I request that STAPPA provide that information.

The article then states, apparently based on a conversation with Mr. Becker, that:

> The second part [of the STAPPA plan] calls for new federal controls on stationary and mobile sources of hydrocarbons, which are precursors to ozone formation in the lower atmosphere, Becker said. Fifteen or more industrial categories should be controlled, and EPA should issue control technology guidance for these industries, he said.
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> Synthetic organic chemical manufacturers, architectural coating firms, and public sewage treatment plants are major air emission sources that are not but should be regulated, he said. Controls on evaporative emissions from gasoline service stations also should be imposed, he said.
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> National controls on certain industries are needed because otherwise companies could "play one state off another" to obtain favorable treatment, Becker said.
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> * * * *
>
> The third part of the STAPPA-ALAPCO strategy involves state pollution control measures. At a minimum, each metropolitan area should adopt all reasonably available control technologies for any significant emission sources, Becker said. Such programs would help address the problem of transport of air pollutants, he said, because even areas that meet the federal standards can contribute to another area's non-attainment.

The article also quotes Mr. Becker as expressing "frustration over the delay in EPA developing a policy," noting that EPA announced a policy last June, "but the agency has not fleshed out that policy with specific changes in enforcement and other programs." I have the impression from that article and another in the publication, Inside EPA, that STAPPA is quite critical of EPA over this issue.

Maybe that criticism is warranted in STAPPA's view, but a review of EPA Administrator Thomas' speech of June 23, 1986 indicates that he was trying to develop a policy not for the present, but for the future (i.e., beyond December 31, 1987) and he was seeking input in its development. He said:

> In June of 1986, I face much the same dilemma. A number of areas across the country still have not met the ozone standard. Some of the areas are close to attainment; they should make it by the deadline. Others simply will not make it, no matter how hard they try. The Clean Air Act provides us with little guidance on how to address chronic nonattainment

> problems after the December 31, 1987, deadline. In short, ozone presents us with two monumental -- and related -- challenges: how do we protect public health, and how do we effectively administer the Clean Air Act beginning in 1988.
>
> EPA is now in the process of trying to define its response to these challenges. Given the extent of ozone nonattainment, our historical efforts to control ozone, the costs and complexity of additional control, and the lack of legislative guidance, we are looking for advice and insight from everyone with an interest in ozone. That's why I'm here today. Just as in 1983, it is important that the members of APCA understand both what we're considering and why. Your participation and your creative contributions will be essential if we are to define a sound strategy to guide us through these uncharted waters.

Since then, his General Counsel quite properly called the "Sustained Progress Program" which was part of his developing strategy into serious question legally in a November 25, 1986 opinion and Mr. Thomas is re-examining the matter for presentation to Congress. I should stress that earlier this year I questioned the legality of the so-called "REEP" program and requested such a legal opinion. While I can agree that it would have been better to resolve this legal issue far earlier at EPA, I am sure you would agree that having the opinion at this time is better than months from now after EPA, the States, and others devote considerable resources. Further, I feel certain EPA will welcome your organization's December 1986 "input" described in the above article for consideration in its re-examination of the issue.

In regard to the STAPPA plan, I have several comments.

First, as you know, the Clean Air Act requires the States to adopt (and EPA approve) State Implementation Plans (SIP) for attainment of ozone and other standards that:

> -- provide for implementation by the State and local governments of "all reasonably available control measures as expeditiously as practicable;"
>
> -- require "in the interim, reasonable further progress," including emission reductions from existing sources, "through the adoption, at a minimum, of reasonably available control technology;" and
>
> -- there be "written evidence" that these governmental entities "have adopted . . . the necessary requirements and schedules and timetables for compliance, and are committed to implement and enforce" the SIP.

The SIPs are supposed to provide for attainment by the deadline at the end of this year, not one day later.

The Act also specifies in section 101 that "the prevention and control of air pollution at its source is the primary responsibility of States and local governments." In short, State and local governments are now required to meet SIP commitments and the requirements of the Act by December 31, 1987 or sooner with or without EPA "assistance and leadership," although that should also be forthcoming consistent with other requirements of law, such as Gramm-Rudman-Hollings. Further, EPA is obligated to enforce those commitments and make "SIP calls" as I have noted in my letter to EPA.

In general, parts one and three of your organization's December plan seem to coincide nicely with the existing requirements of the law and their restatement is appropriate and welcome. They appear to generally reflect what is now required by the law.

Second. However, the second part of the STAPPA document calls for "new Federal controls on stationary and mobile sources" and Federal "control technology, guidance" for 15 industries, including bakeries, marine vessels, plastic parts and sewage treatment plants. I question the need for such Federal controls and guidance or their usefulness at this late date. Clearly, they will not help to meet the December 31, 1987 deadline.

I am also concerned because this part of the STAPPA proposal, if adopted, seems to transfer the burden of controls from State and local governments to Congress and EPA because "companies could 'play one state off another' to obtain favorable treatment." But it is not clear why, in 1987, as EPA and citizen suit enforcement of the SIPs looms on the horizon, that this possibility becomes so prominent and important as to require such a transfer. While such pressures undoubtedly occur at the local and State levels, they are certainly not uncommon at the Federal level. Indeed, I understand from a recent newsletter that representatives of the bakeries visited the White House and EPA last month regarding these very matters. This apparently occurred after a Wall Street Journal article about pollution problems of this industry. Nevertheless, I fail to see why that should justify transfer of this responsibility to EPA or Congress.

Even more importantly, the resources and time it would take at the Federal level to develop and implement such controls and/or guidance at the Federal level would, I fear, ensure their ineffectiveness for several years. Such a delay would be unfair to the States and local governments that have met the deadlines, albeit with some difficulty undoubtedly.

Nevertheless, I welcome a further and more detailed explanation of STAPPA's proposal for the near and long-term and of the so-called pressure problems that concern the State air administrators. In responding, please explain the role of the Governors in helping the administrators overcome these pressures. Please also explain to what extent you intend these Federal "controls" and "guidance," including mandatory inspection and maintenance which we now have in parts of Michigan and some other States, for stationary and mobile sources to apply only to the ozone nonattainment areas and not to the entire Nation and whether such a limited application is possible under the law. Are these controls, etc., needed in all States? What problems or inequities would they create? What parts of your proposal would require legislation?

I am sending a copy of this letter to EPA to address this issue of pressure, in light of Mr. Emison's comments in the above article.

In regard to marine vessels, my enclosed letter to the Secretary of Transportation indicates that the problem is not one of EPA guidance but of serious safety concerns expressed by the Secretary and the Coast Guard to several Governors. Clearly, the Clean Air Act does not override those safety concerns, assuming that they are real. That is being examined by the Subcommittee.

I also note STAPPA's criticism of EPA's use of modeling which you observe is "an inexact science, particularly for ozone." While I certainly agree that it is "inexact," I am not clear why STAPPA particularly singles out ozone. Also, I am not sure why "EPA's plan not to take action against an area if it can demonstrate attainment within four years using a model is ill-conceived." Again, I would appreciate a fuller explanation of these comments and your suggestions for alternatives at this late date in the nonattainment enforcement program. In making it, you may want to consider my letter of June 9, 1986 and EPA's September 19 reply which are enclosed.

I commend STAPPA for urging immediate controls on gasoline volatility. They are needed and I agree that they will provide significant emission benefits.

Before closing, I also call to your attention my comments in the enclosed letter to EPA of November 6 concerning the extent of the ozone nonattainment problem. As the letter indicates, all of the estimated 73 ozone nonattainment areas are not at the same level of nonattainment. Some may achieve attainment this year or soon thereafter or are only marginally over the limit. Thus, it is misleading and somewhat scary to suggest that 70 million people are at risk. While such figures help make headlines, I question whether they represent the true facts from a sound health standpoint. The Subcommittee is seeking better data from EPA about these areas and the risk. I welcome STAPPA's input for our investigation.

I am sending a copy of this letter with the enclosures to the National Governors' Association and inviting their comments on these matters, including the STAPPA proposal.

I would appreciate your reply to this letter by February 10, 1987. Please provide a copy thereof to the GAO.

With best wishes.

Sincerely,

John D. Dingell

JOHN D. DINGELL
Chairman
Subcommittee on
Oversight and Investigations

Enclosures (5)

cc: Honorable Norman F. Lent, Ranking Minority Member
Subcommittee on Oversight and Investigations

Honorable Henry A. Waxman, Chairman
Subcommittee on Health and the Environment

Honorable Edward R. Madigan, Ranking Minority Member
Subcommittee on Health and the Environment

Honorable Lee M. Thomas, Administrator
Environmental Protection Agency

Honorable Francis S. Blake, General Counsel
Environmental Protection Agency

Honorable James C. Potter
Assistant Administrator for Air and Radiation
Environmental Protection Agency

Honorable S. William Becker, Executive Director
State and Territorial Air Pollution
Program Administrators

Honorable Charles A. Bowsher, Comptroller General
General Accounting Office

Honorable Bill Clinton, Chairman
National Governors' Association

Honorable James J. Blanchard, Governor
State of Michigan

STAPPA / ALAPCO

STATE AND TERRITORIAL
AIR POLLUTION PROGRAM
ADMINISTRATORS

ASSOCIATION OF
LOCAL AIR POLLUTION
CONTROL OFFICIALS

S. WILLIAM BECKER
EXECUTIVE DIRECTOR

February 9, 1987

Congressman Henry A. Waxman
Chairman
House Energy and Commerce Subcommittee
on Health and the Environment
2415 Rayburn House Office Building
Washington, DC 20515

Dear Congressman Waxman:

On behalf of the State and Territorial Air Pollution Program Administrators (STAPPA) and the Association of Local Air Pollution Control Officials (ALAPCO), we thank you for your letter of January 20, 1987 inquiring about the difficulties state and local agencies are experiencing in attempting to attain the National Ambient Air Quality Standards for ozone and carbon monoxide. STAPPA is the national association of state air pollution control officials in the 54 states and territories. ALAPCO is the national association of local air pollution control officials representing over 150 major metropolitan areas throughout the country. We share your concern that more than 79 million Americans now live in areas that fail to attain the health-based standards for ozone and carbon monoxide and agree that this situation poses a serious national health problem.

There is strong scientific consensus that exposure to ozone at concentrations above the existing federal standard (0.12 parts per million) adversely affects public health. Moreover, no sector of the population appears to be immune. According to EPA, "the major subgroups of the population that appear likely to be at greatest risk to the effects of ozone include: (a) individuals with preexisting respiratory disease..., (b) 'responders' who are otherwise healthy individuals, both adults and children..., and (c) individuals exercising heavily during exposure to ozone."

The major effects of elevated exposure to ozone on these individuals are disturbing. For example, scientists have demonstrated that a "quantitative relationship [exists] between alterations in pulmonary function and ozone exposure concentrations" at or near the standard, even for healthy exercising individuals.

In addition, epidemiological studies suggest that exposure to ozone can be associated with "lung function decrements, symptoms and aggravation of existing respiratory disease." Finally, animal toxicity data are revealing that exposure to ozone may increase "susceptibility to respiratory infection, lung structure damage and extrapulmonary effects...."

Exposure to unhealthful levels of carbon monoxide also presents a serious threat to millions of individuals living or working in the central business districts of our major cities. Carbon monoxide, when inhaled, enters the bloodstream and disrupts the delivery of oxygen to the body's tissues. According to EPA, "those most sensitive to this effect are the estimated 9 million people with cardiovascular disease, particularly those with angina or peripheral vascular disease. Their conditions are aggravated when CO acts on the blood supply to form harmful levels of blood carboxyhemoglobin." In addition, EPA has concluded that exposure to low levels of carbon monoxide not only affects "aerobic capacity, visual perception, manual dexterity and learning ability," but may also affect the fetus.

You have expressed interest in determining why the National Ambient Air Quality Standards for ozone and carbon monoxide are not being achieved in over 70 areas throughout the country. In response to your request, we have sent a letter (enclosed) to each of the state and local air pollution control agencies representing these projected nonattainment areas, asking them to provide you with an explanation. We are enclosing four state responses with our letter and expect that you will hear from the other agencies shortly. (We have also asked agencies to provide you with the area-specific information you request on their implementation of Section 172 (b)(11)(a) of the Clean Air Act and on the impact of burning alternate fuels in industrial and utility boilers.) However, at this time, we would like to highlight the major reasons for nonattainment.

In 1982, as you know, states were required to submit State Implementation Plans "providing for" attainment of the National Ambient Air Quality Standards for ozone and carbon monoxide. At that time, almost every area was able to demonstrate attainment of the standards by the Congressionally-mandated 1987 deadline. Unfortunately, we are now finding that what was provided for in 1982 -- when SIPs were submitted -- is not, in many cases, being fully achieved.

With respect to ozone, there are four major reasons for continued nonattainment, including (1) inadequate resources, (2) poor understanding of the science of ozone formation, (3) interstate transport and (4) the failure of EPA to provide guidance to achieve additional reductions.

Inadequate Resources

The development and implementation of ozone State Implementation Plans (SIPs) have been extremely ambitious tasks requiring substantial resources. As federal funds (which comprise one-third of agencies' budgets) have decreased, state and local agencies have been required, nonetheless, to fulfill their responsibilities by regulating hundreds (sometimes thousands) of industrial facilities in a short period of time. Agencies must continue to upgrade monitoring networks, develop emissions tracking systems, improve the effectiveness of vehicle inspection and maintenance programs and enhance enforcement programs by conducting more frequent inspections of a greater number of facilities. The difficulty many of these areas have experienced in achieving their anticipated reductions has not been due to a lack of will, but rather the lack of adequate staff and resources to perform these tasks.

Poor Understanding of the Science of Ozone Formation

The science of ozone formation is complex and poorly understood. Many nonattainment areas that had provided for attainment by December 31, 1987 have underestimated the necessary hydrocarbon reductions required to reach attainment because of problems encountered with EPA's mathematical models. Models, such as EKMA (Empirical Kinetic Modeling Approach), on which state and local agencies relied in 1982 to project attainment by 1987, have underpredicted by 30 percent or more the amount of reductions needed to attain the standard. Similarly, EPA's mobile source models -- Mobile 2, 3 and 4 -- have been overzealous in their predictions. Today, in-use vehicle emissions are significantly higher than what the models predicted, further contributing to the failure of many areas to reach attainment.

Interstate Transport

Transport of ozone and its precursors (hydrocarbons and nitrogen oxides) is a significant problem causing or exacerbating ozone nonattainment. For example, many areas with approved SIPs providing for attainment are actually monitoring high levels of ozone (at times, in excess of the standard) entering their states. Due to the regional nature of the problem, it is extremely difficult to ascertain the specific sources contributing to nonattainment, and therefore difficult for individual states to take appropriate actions under the existing ozone control program. EPA, to date, has failed to adequately address this issue. Consequently, regardless of what controls these areas require in their regions, they still will be considered nonattainment.

Lack of EPA Guidance

Many areas have not been able to reach attainment because of their inability to regulate facilities other than those for which EPA defines "Reasonable Available Control Technology" (RACT). Until five years ago, it was a common practice for EPA to define RACT by publishing Control Technique Guideline (CTG) documents. State and local agencies were familiar with these guidelines and could use them quite effectively in imposing RACT requirements on industry. However, more recently, EPA has not published a single CTG, which has prevented states from regulating industries (e.g., gasoline stations, architectural coating operations, etc.) that heretofore have been unregulated.

With respect to carbon monoxide, which is predominantly a mobile source problem, it is also clear that a number of areas will not be able to attain the December 31, 1987 deadline. There are several factors contributing to this nonattainment, including the fact that motor vehicles have not always proven to be as durable in the "real world" -- where vehicles are improperly maintained and tampered with -- as they are under EPA certification conditions -- where vehicles are carefully controlled.

You are correct in concluding that "the success or failure of state air pollution control efforts is to some extent dependent on financial, technical and regulatory support from the Federal Government, and especially the Environmental Protection Agency." The Clean Air Act is very explicit in recognizing this under Section 101, where it states that "Federal financial assistance and leadership is essential for the development of cooperative Federal, State, regional and local programs to prevent and control air pollution" [emphasis added].

Yet, what we have found is that federal financial assistance and leadership (i.e., regulatory and technical support) has diminished in recent years, thus impairing our ability to attain the standards on time. For example, since the Clean Air Act was last revised in 1977, federal financial support has not only failed to keep pace with inflation but, in terms of real dollars, has declined by over 20 percent. This has occurred in spite of the fact that state and local agencies have taken on considerable new responsibilities during this period, including controlling air toxics and acid rain, Prevention of Significant Deterioration, and developing and enforcing SIPs for the criteria pollutants, including ozone and carbon monoxide. In effect, state and local air pollution control agencies are charged with implementing programs to meet today's needs with a federal funding level (in real dollars) less than that of 1972.

We are also concerned with EPA's failure to provide the regulatory and technical assistance necessary to attain the standards in an expeditious manner. EPA has been developing an ozone control strategy for two years and still does not appear to be close to publishing even a proposed strategy. In reaching attainment, agencies rely upon the policy guidance and technical information provided by the federal strategy.

STAPPA and ALAPCO believe that if EPA had published its ozone control strategy -- as it promised last year -- and committed to the kinds of federal stationary and mobile source measures that it is still only "considering," attainment of the ozone standard by the December 31, 1987 deadline would not elude so many of the projected post-1987 nonattainment areas.

For example, we have found that the ability of some states to control evaporative emissions through Stage II Vapor Recovery and by limiting volatility may actually determine whether or not the region attains the ozone standard by the deadline. Consequently, for over five years, both STAPPA and ALAPCO have urged EPA to publish technology guidance defining "Reasonably Available Control Technology" for Stage II Vapor Recovery and have recommended that the agency set a summertime volatility limit on gasoline. However, despite many promises, EPA has not taken any action. As a result, most states have not adopted Stage II Vapor Recovery because they are either awaiting a decision by EPA (which has been promised since 1985) and/or are precluded by state law (e.g., Maryland and Illinois) from adopting regulations more stringent than those set by EPA. With respect to volatility, it is extremely difficult for states to regulate the volatility of gasoline because it is produced and marketed on a regional basis, rather than by individual states. Until EPA makes these and other decisions, most state and local agencies will be unable to avail themselves of these necessary ozone control strategies.

You asked us to comment on three other specific EPA activities (or "inactivity") -- evaporative emissions from gasoline refueling, the impact of the recent rollback in federal fuel economy standards for motor vehicles and EPA regulatory reforms such as emissions trading, bubbling, banking and netting.

STAPPA and ALAPCO have recommended three strategies to control evaporative emissions from refueling operations, including the establishment of a summertime gasoline volatility limit, the adoption of Stage II Vapor Recovery in nonattainment areas, and the imposition of a nationwide onboard control program. To date, EPA has refused to make decisions on any of these.

STAPPA and ALAPCO are extremely concerned that the volatility of gasoline has significantly increased over the past several years, above the nine pounds per square inch (psi) level on which 1982 SIPs were based. As a result of these higher volatility levels, we are experiencing greater emissions of volatile organic compounds than expected, preventing many areas from attaining the ozone limits provided for in their SIPs. Since 1984, STAPPA and ALAPCO have urged EPA to set a 9 psi summertime volatility limit.

As we mentioned earlier, Stage II Vapor Recovery is also an important component of any ozone control strategy and one that may actually determine whether or not certain regions of the country attain the ozone standard. STAPPA and ALAPCO have recommended since 1982 that EPA publish a CTG for Stage II Vapor Recovery that would assist states in defining Reasonably Available Control Technology.

Finally, STAPPA and ALAPCO have also recommended that EPA require a nationwide onboard control program beginning in model year 1989. While the associations acknowledge that such a program will have negligible near-term impacts on the ozone nonattainment problem, it will provide a significant reduction in evaporative emissions from refueling operations when the program becomes fully operational.

STAPPA and ALAPCO believe that the recent rollback in the fuel economy standards could lead to increased emissions in hydrocarbons, particularly if motor vehicle manufacturers do not make appropriate adjustments. We recommend that the National Highway Traffic Safety Administration consider the impacts on air quality when recommending future adjustments to fuel economy standards.

STAPPA and ALAPCO are also concerned that several "regulatory reform" measures adopted by EPA in recent years may tend to exacerbate the ozone nonattainment problem in this country. For example, EPA's policy overturning the "dual source" definition allows facilities to net out of new source review requirements, thereby contributing to excess emissions of ozone precursors. STAPPA and ALAPCO believe that all new facilities (i.e., individual installations) that emit more than 50 tons per year of pollution should be required to install the "Best Available Control Technology." STAPPA and ALAPCO also oppose the component of EPA's emissions trading policy that allows trading to take place in nonattainment areas that lack fully-approved SIPs. Without an approved plan, it is impossible to ascertain the quantity of emission reductions needed to attain the ozone standard, and therefore, it is inappropriate to assume that there are "excess" emissions for trading. Finally, we are concerned that EPA's policy to allow New Source Performance Standard bubbles will seriously undermine the NSPS program and unnecessarily contribute to increased emissions in ozone's precursors.

We appreciate your favorable comments on the draft STAPPA/ALAPCO Ozone Control Strategy that the associations adopted in December. We are currently in the process of refining this policy and expect to approve a final version on March 19th. However, we are able to share with you several preliminary details of the ozone strategy.

Part I of the draft STAPPA/ALAPCO strategy is designed to maximize the effectiveness of local, state and federal ozone control measures developed under the existing clean air program. This would entail, for example, eliminating program deficiencies, conducting greater surveillance and enforcement of the federal motor vehicle program, and establishing a volatility limit of 9 pounds per square inch.

In Part II of the draft STAPPA/ALAPCO strategy, we are recommending that EPA develop and implement, as expeditiously as possible, several federal stationary and mobile source measures that all nonattainment areas should adopt.

With respect to stationary sources, STAPPA and ALAPCO believe that EPA should issue technology guidance for the following industries:

Architectural Coating
Wood Furniture Coating
Autobody Refinishing
Metal Rolling
Traffic Paint
SOCMI Distillation
SOCMI Batch Process
Coke Oven By-Product Plants
Treatment, Storage and Disposal Facilities
Bakeries
Publicly Owned Treatment Works
Web Offset Lithography
Stage II Vapor Recovery
Plastic Parts Coating
Clean-up Solvent
Oil and Gas Production
Marine Vessels
Other Categories Listed In EPA Region IX's Reasonable Extra Efforts Program (REEP)

We have selected these particular industries because (1) they have not been regulated previously, (2) controls are generally commercially available, and (3) they offer the potential for significant reductions of volatile organic compounds, particularly in relation to other available and unregulated sources of VOCs.

We have also identified several federal mobile source measures that should be implemented. In addition to onboard controls and limits on volatility, these include:

Updating compliance procedures -- EPA should upgrade its compliance procedures to ensure that vehicles perform as cleanly in practice as they do under the Federal Test Procedure (FTP).

Conducting greater surveillance/enforcement -- EPA should improve the enforcement of its existing mobile source program to ensure that the maximum environmental benefits result. EPA should eliminate loopholes and resolve ambiguities in this program.

Implementing short idle tests -- Many vehicles that pass the FTP may not meet subsequent short test standards required by state inspection and maintenance programs. Integrating the short tests into the FTP would enhance the effectiveness of the mobile source control program, including the federal warranty program.

Adopting light duty truck standards -- EPA has issued a notice of proposed rulemaking for further hydrocarbon controls in this motor vehicle class. Final action on this rule is needed.

Upgrading inspection and maintenance requirements -- Existing I/M programs require refinements and should focus on obtaining further hydrocarbon reductions in the immediate future. EPA should examine future I/M program designs, such as an onboard emission control diagnostic system.

Phasing out lead in gasoline -- EPA has proposed to phase out lead in gasoline. Such a rule would eliminate tampering and improve emission control durability.

Improving tampering analysis -- Tampering surveys conducted by various agencies indicate that emission control tampering is highly variable from year to year and depends upon local and regional economic and demographic factors. Therefore, EPA should require anti-tampering programs in areas where they would provide the greatest environmental benefits.

Establishing an auto mechanic incentive program -- The ability of automotive mechanics to restore vehicles to a properly functioning condition remains the key to successful I/M and anti-tampering programs. STAPPA and ALAPCO recommend training programs and other incentives for mechanics to maximize the emissions reduction potential of these I/M programs.

Expanding geographic coverage for I/M -- Under existing guidelines, states may be required to strengthen I/M programs in urban areas, while the surrounding areas remain exempt. STAPPA and ALAPCO propose a program whereby greater geographic coverage for I/M could be used to offset more stringent controls in these areas.

In Part III of our strategy, STAPPA and ALAPCO recommend the adoption of new state and local requirements, including (1) minimum requirements for attainment areas, (2) additional requirements for nonattainment areas with "moderate" ozone problems (below a specified threshold), and (3) further requirements for nonattainment areas with "severe" ozone problems (above a specified threshold).

For attainment areas, we are recommending the adoption of "Reasonably Available Control Technology" on facilities emitting above de minimus levels, particularly where they are contributing to an area's nonattainment problem.

For moderately polluted areas (i.e., below a specified threshold), we are urging that all measures under Part I (maximizing the effectiveness of existing programs) and Part II (federal stationary and mobile sources) be implemented. STAPPA and ALAPCO believe that areas with "moderate" ozone problems should be able to attain the standard within a relatively short period of time (i.e., three to five years). The associations also believe that the measures necessary for attainment are commercially available and should be identified as RACT by EPA. However, if EPA does not commit on its own to defining these measures as RACT, then the agency should be required to do so by Congress.

For the most severely polluted areas (i.e., above a specified threshold), we recommend (1) the adoption of "Best Available Retrofit Technology" on all existing facilities, (2) the prohibition of bubbling/netting, and (3) the establishment of emission caps based on historical operating rates.

We recommend BART, rather than RACT, to differentiate areas that are moderately polluted and just above the standard (e.g., Charlotte) from areas that may not attain the ozone standard for several years (e.g., Houston). STAPPA and ALAPCO suggest prohibiting bubbling and netting in severely polluted areas because we can not justify any "excess" emissions in these areas for trading. In addition, we suggest establishing emission caps in these areas in order to prevent facilities from increasing their operations and exacerbating an already serious air pollution problem.

Additionally, we are recommending several measures concerning the siting of new sources. Specifically, we believe that New Source Review rules should be revised to require that:

- the applicability definition for major sources be set at 50 tons per year;
- the dual source definition be reinstituted; and
- offsets be required for new major sources in all nonattainment areas.

These rule changes are necessary to ensure controlled growth in the future. Section 166 of the Clean Air Act requires EPA to regulate growth in attainment areas by promulgating regulations for the Prevention of Significant Deterioration (PSD) for Set II pollutants, including ozone and its precursors. However, the agency has never implemented this program.

Finally, you have asked our views on the potential effectiveness of certain mobile source proposals in attaining the standards.

Our draft ozone control strategy was not originally intended to recommend changes to the Clean Air Act and therefore does not include motor vehicle emission controls other than those mandated under the existing act. However, STAPPA and ALAPCO have consistently taken the position that motor vehicles should contribute their fair share to the realization of national air quality goals.

If ozone control is to involve additional reductions from stationary sources, it may be equally appropriate to impose further controls on motor vehicles as well, particularly where they are technologically feasible. In California, 80 percent of newly manufactured light duty vehicles are certified at or below 0.25 grams per mile non-methane hydrocarbon (compared to the 0.39 gpm standard). Moreover, the state recently adopted a 0.4 gpm light duty vehicle standard for NO_x.

Finally, STAPPA and ALAPCO encourage the wider use of cleaner burning alternative fuels, such as methanol and natural gas, and suggest that incentives be provided to promote their general use. The demand for alternative fuels is subject to many economic uncertainties. Wider application should therefore be integrated into a national energy policy.

Thank you very much for soliciting our views. If you have any questions, please do not hesitate to contact either of us or STAPPA and ALAPCO's Executive Director, S. William Becker.

Sincerely,

Donald Moline
Donald Moline
President of ALAPCO

Robert Miller
Robert Miller
President of STAPPA

Attachments

Congress of the United States
House of Representatives
Committee on Energy and Commerce
Room 2125, Rayburn House Office Building
Washington, DC 20515

January 20, 1987

Mr. Robert P. Miller
President
State and Territorial Air Pollution
  Program Administrators and
Chief of Air Quality Division
Department of Natural Resources
P. O. Box 30028
Lansing, MI 48909

Dear Mr. Miller:

I look forward to working with you in your new capacity as President of the State and Territorial Air Pollution Program Administrators. Congratulations on your election to that position.

I am writing to ask STAPPA's views on one of the most important issues which will face the Health and Environment Subcommittee in the 100th Congress: the failure of many of America's urban areas to attain the Clean Air Act's health based air quality standards. More than 79 million Americans now live in areas that have failed to achieve one or more of the health based ambient standards. Please explain whether STAPPA agrees that this situation poses a serious national health problem, especially in light of recent EPA data indicating that the current standard for ozone may not be adequate to protect public health.

I would like STAPPA's views on why the ambient air quality standards for ozone and carbon monoxide are not being achieved. Specifically, please explain why states have not been able to attain the standards through the measures called for in their State Implementation Plans, as these plans were intended to bring about compliance with the standards by the December 31, 1987 deadline. For each area which is projected by EPA not to achieve the standard by this deadline, please list all steps called for in the SIP, describe whether and how each step was implemented, and estimate the air quality impact, and number of tons of emission reductions or increases associated with the action taken. Please describe key assumptions considered in the air quality projections which were a part of the SIP "demonstration" of attainment for these areas, identify those assumptions which have proven to be incorrect, and provide an explanation.

I understand that the success or failure of state air pollution control efforts is to some extent dependant on financial, technical, and regulatory support from the Federal Government, and especially the Environmental Protection Agency. Please provide STAPPA's views on the adequacy of EPA's support in these areas, and the impact on state efforts to attain air quality standards. Specifically, please address the air quality impact of EPA activity or inactivity in the following areas: the promulgation of control technology guidance for stationary sources, the failure of EPA to promulgate regulations for the control of evaporative emissions from gasoline refueling of motor vehicles, the impact of the recent rollback in Federal fuel economy standards for motor vehicles, EPA regulations offering a definition of "reasonably available control technology" under section 172 of the Act, and EPA "regulatory reforms" such as emission trading, bubbling, banking, and netting.

Please describe all other factors which have contributed to the failure of states to achieve the ozone and carbon monoxide standards.

Please describe state and Federal efforts to implement section 172 (b)(11)(a) of the Clean Air Act. This provision of the law requires that prior to the issuance of a new source permit, an analysis must be conducted of alternative sites and production processes from an air quality perspective.

I would also like STAPPA's views on how these standards can most rapidly be achieved. I have seen the December, 1986 document entitled "STAPPA/ALAPCO Ozone Control Policy" and I welcome the many excellent suggestions it includes. Any additional detail that you could supply on these recommendations would be very helpful. In particular, please describe in more detail STAPPA's recommendations for Federal actions, including: updated compliance procedures, implementation of the short idle test, use of the National Audit System, establishment of a volatility limit, greater surveillance/ enforcement, the development of control technology guidance for stationary sources, the adoption of nationwide onboard controls, the adoption of new light duty truck standards, upgrading of I/M requirements, lead phase out, improved tampering analysis, mechanic incentive program, and expanded geographic coverage for I/M. Please also describe in more detail STAPPA's recommendations for new state and local ozone controls, including: the adoption of RACT on all existing and new sources greater than a deminimus level, the adoption in nonattainment areas of BART on all existing sources, prohibition in nonattainment areas of bubbling/netting for existing sources to avoid BART requirements or for new sources to escape new source rules, and the establishment of emission caps for all plants in nonattainment areas based on historical operating rates. Please explain why, in light of the nationwide severity of the nonattainment problem and the importance of transport in the regional ozone problem, the prohibition of bubbling/netting to escape new source review rules should apply only in nonattainment areas, rather than covering all sources. Would STAPPA favor a tightening of the EPA definition of "source" in nonattainment areas to further limit emissions?

Please provide any additional recommendations you may have for making progress toward achievement of the ozone and carbon monoxide standards.

I am interested in STAPPA's views on the potential effectiveness of other approaches for moving toward the attainment of air quality standards. For example, although the STAPPA recommendations include a number of mobile source related proposals, they include no proposals for tighter tailpipe standards for automobiles. Please evaluate potential air quality gains available through the imposition of nationwide automotive tailpipe standards of .25 gpm HC, .40 gpm NOx, and 3.4 gpm CO. Please also evaluate potential air quality gains available through the imposition of correspondingly strict standards for trucks, buses, and diesel vehicles. Would STAPPA favor the adoption of such standards? In addition, please evaluate the air quality gains available through the widespread use of alternative motor vehicle fuels such as methanol and compressed natural gas. Would STAPPA favor the establishment of a program calling for the use of such fuels?

Please also evaluate the potential air quality gains available through the widespread use at stationary sources of cleaner-burning alternate fuels such as methanol or natural gas in place of oil or coal. Please list all industrial and utility boilers currently operating in nonattainment areas, and indicate the type and amount of fuel burned in each. Please specify the hydrocarbon, nitrogen oxide, and sulfur dioxide emission rate for each boiler. Please indicate whether each boiler is currently capable of burning natural gas as a primary fuel. Please indicate the estimated increase in costs at each boiler, and the resulting reduction in HC, NOx and sulfur dioxide emissions if the boiler were to switch to natural gas as the primary fuel. Would STAPPA favor a Federal program calling for the use of such fuels?

As the non-attainment issue is likely to be one of the first addressed by the Health and Environment Subcommittee in the 100th Congress, I ask that you respond to this letter on or before Monday, February 9. Thank you for your cooperation.

With every good wish, I am,

Sincerely,

Henry A. Waxman

HENRY A. WAXMAN
Member of Congress

HAW/gwn

RESPONSES OF NICK NIKKILA TO QUESTIONS OF SENATOR STAFFORD

Ozone Nonattainment

1. **Can each of you tell me what would be the effect in your respective nonattainment area if there is no change in the deadline and sanctions provisions of the current Act by January 1, 1988?**

The St. Louis metropolitan area is a nonattainment area for ozone; part of the St. Louis area is nonattainment for carbon monoxide. The State Implementation Plans (SIPs) for the area have received final approval by EPA. The Kansas City metropolitan area is an ozone nonattainment area. The SIP has been submitted to EPA and approval is being withheld until all SIP commitments are implemented.

Our interpretation of the act is that sanctions (in the form of a construction ban) are to be imposed if an approvable SIP is not submitted in accordance with Sections 110 and 172 of the act. Failure to submit an approvable plan also triggers the withholding of certain highway funds, sewage treatment funds and air grants if EPA determines the state is not making a reasonable effort to submit a plan. Additionally, the act forbids EPA to award grants (e.g., air grant) if the agency determines the state is not implementing its approved SIP.

Post-1987 impacts for both the St. Louis and Kansas City areas are greatly dependent upon discretionary determinations by EPA. Strict adherence to the current statistical projection of "expected exceedances," without consideration of the reductions to be achieved during 1987 but not fully reflected by monitoring data for 1985-1987 ozone seasons, could result in a call for a SIP revision and/or the imposition of sanctions. Regardless of sanctions, monitored exceedances during the 1988 ozone season could result in a ban on the issuance of new source permits depending upon the interpretation given to Sections 171 and 173 of the current act. While EPA has a great deal of latitude prior to 1988, if our interpretation of the sanction provision of the act is correct, it would be difficult for EPA to impose sanctions, other than withholding air grants, after 1987 unless the SIPs are declared insufficient or unapprovable prior to December 31, 1987.

a. What would be the effect of the Act's moratorium on permits for major new or modified sources?

If the Section 110 ban on new major source construction were imposed, we would be prohibited from allowing a new source to construct if its emissions of VOCs would equal or exceed 100 tons per year. Additionally, modification at existing major VOC sources would not be allowed if it would result in an increase in VOC emissions of 40 tons per year or more. EPA's current definition of "source" would allow an existing major VOC source to reduce emissions within the facility so that the net increase from the modification would be less than 40 tons per year. As a result, the construction ban would deter new major sources from locating in the affected area and, to a lesser extent, would stifle expansion at existing sources.

b. Do you anticipate that highway funds would be withheld for those areas?

If we are correct in our interpretation that the withholding of highway funds is tied to the determination that the state is not making a reasonable effort to submit an approvable plan, then we would not anticipate that highway funds would be withheld in either metropolitan area.

2. Can each of you tell me what controls, if any, have been or are being imposed in your nonattainment areas that have not been requried in other areas?

I do not beleive that any of our control requirements are unique to Missouri. In addition to EPA's category I, II and III Control Technique Guidelines (CTGs), we have developed and implemented rules on paint manufacturing processes, the application of adhesives and deadeners during autobody assembly and Stage II Vapor Recovery and have added a check of the vehicles inlet restictor to our annual statewide safety inspection. It is my understanding that we were the first state to develop a RACT requirement for paint manufacturers; other areas have since adopted similar control requirements.

3. Will each of you give your view as to whether more significant VOC reductions will result from imposition of new control measures or through better implementation of existing measures.

I am very much of the belief that, on a nationwide basis, new control requirements will provide a substantially greater level of reduction than will better implementation of existing regulations. Exceptions would be those few areas that have been extremely tardy in implementing the existing CTGs. The resource requirements rise very rapidly as maximum implementation is approached. Optimization, which recognizes real world constraints (time, money, staff, training, etc.), would probably result in an additional three to five percent reduction, whereas new control measures (state and federal) should result in an approximate reduction of 15 percent or more.

RESPONSES OF NICK NIKKILA TO QUESTIONS OF SENATOR SIMPSON

Ozone Nonattainment

1. **EPA and now some states are considering reducing the volatility of motor gasoline to reduce hydrocarbon emissions. Won't this increase our demand for crude oil imports and increase the costs of gasoline at the pump? Is STAPPA at all concerned that such an impact in crude oil imports will negatively impact the energy security of the nation?**

Volatility of gasoline has increased in recent years because refiners are now adding light-end hydrocarbons, such as butane, to their product. This allows the refiner to receive a higher profit from these light ends. An increase in volatility means that more of the fuel will evaporate at ambient temperatures and pressures. The consumer pays for fuel on a volume basis but does not receive full value because that volume is now reduced at an accelerated rate due to increased vaporization. In short, the customer does not receive all the energy for which he has paid.

A reduction of the fuel volatility will simply mean the customer will receive more usable energy per gallon purchased. Thus, the factor which will increase the need for crude oil is energy demand, not reduced volatility.

Light ends do provide an octane benefit. As these light ends are reduced, refiners will have to utilize additional octane enhancers. This is expected to result in an additional 1.5 cent/gallon cost to the consumer, if volatility is reduced on a nationwide basis.

2. Did STAPPA consider the enforcement costs of a Stage II program in establishing your current policy position which calls for Stage II, RVP reduction and onboard canisters? Are your members prepared to increase the local tax base to enforce such programs properly?

Clearly, control measures which require inspections of a large number of small emission sources will require more personnel than control measures which affect only a small number of very large emission sources. In the case of Stage II, the "rule of thumb," based on the California experience, is that one inspector will be required per every 800-1,000 refueling stations. This will allow for semi-annual inspections of each facility. In the case of St. Louis, Missouri, the only area currently initiating implementation of a Stage II program, there are approximately 2,000 such facilities. Thus, two people could conceivably perform the necessary field inspections. Because the St. Louis metro area is divided between two local air pollution control agencies and the state air pollution control agency, three field staff members will be required. An overall coordinator and staff support will bring the total staff needs to six. This means the enforcement cost of the program is approximately $50.00 per ton of pollutant removed. That, added to the capital and annual costs, brings the overall cost-effectiveness of the program to approximately $740.00 per ton of pollutant removed per year. In comparison with other existing control requirements, that is an average to below average overall cost. The overall cost is the real cost to the public, not just the enforcement cost.

On the basis of enforcement cost alone, an argument could be made that onboard is more costly than Stage II. For example: if, and when, an onboard program is implemented, USEPA will probably require that a check of the onboard canister be included in the vehicle inspection and maintenance program and/or the anti-tampering program. If it is further assumed that a check on the canister will take 60 seconds to complete, a cost comparison can be made using St. Louis as the example. The St. Louis I/M program tests approximately 1.2 million vehicles annually. At 60 seconds per canister test, that is 1.2 million minutes of additional work per year, or 20,000 work hours per year. After accounting for federal and state holidays, sick leave and annual leave, an employee work year equates to approximately 1,736 work hours. Dividing 20,000 hours by 1,736 yields 11.5 work years. Holding all other factors consistent with the previous Stage II enforcement cost calculation, that equates to an onboard enforcement cost of $98.00 per ton of pollutant removed as compared to the $50.00 per ton of pollutant removed for Stage II.

STAPPA's primary consideration is the national goal to achieve healthy air quality as expeditiously as practicable. STAPPA believes that a combination of Stage II for the post-1987 nonattainment areas, and a national onboard control program will be a significant step towards meeting that goal. Stage II can provide reductions within a relatively short time period and be phased out when onboard control becomes fully effective.

RESPONSES OF JOHN PAUL TO
QUESTIONS OF SENATOR STAFFORD

Ozone Nonattainment

1. **Can each of you tell me what would be the effect in your respective nonattainment area if there is no change in the deadline and sanctions provisions of the current Act by January 1, 1988? I would appreciate a general reaction now and, either now or for the record, a more specific response to the following questions:**

   a. **What would be the effect of the Act's moratorium on permits for major new or modified sources?**

   b. **Do you anticipate that highway funds would be withheld for those areas?**

Dayton's air quality for the period of 1984-1986 is such that attainment can be demonstrated. However, two exceedances of the standard at one site in 1987 could throw the area back into nonattainment. The effect of this on the Dayton area would depend entirely upon the action taken by EPA. Should EPA declare that the SIP is inadequate, it is possible that the agency may impose a construction ban. Additionally, EPA may threaten to impose highway sanctions for failure to correct identified deficiencies.

The effect of a construction ban would likely be minimal, as sources would be allowed to use in-plant offsets to avoid the ban. Any new sources would probably be at plants with this capability.

Because any federal notice of SIP deficiency would be met with state and local corrective action, it is unlikely that the withholding of highway funds would ever occur.

2. **Can each of you tell me what controls, if any, have been or are being imposed in your nonattainment areas that have not been requried in other areas?**

Controls in the Dayton areas which go beyond the federal minimum are as follows:

a. RACT controls have been imposed on applicable sources, regardless of size, in 18 urban demonstration counties throughout Ohio. Therefore, there are no doubt numerous small sources in the Dayton area which are subject to controls, while similar sources in other parts of the country remain unregulated.

b. Ohio rules require best available technology on new sources throughout the state regardless of size. Thus, there are source controls for sources smaller than those generally reviewed in other states.

3. **Will each of you give your view as to whether more significant VOC reductions will result from imposition of new control measures or through better implementation of existing measures.**

Significant VOC reductions in the Dayton area can come only through the imposition of new control measures. Although better implementation of existing measures may achieve some additional reductions, current implementation is effective. Significant reductions, however, would be realized through Stage II controls, gasoline volatility control and the various measures identified in the STAPPA/ALAPCO Ozone Control Strategy.

RESPONSE OF JOHN PAUL TO
QUESTION OF SENATOR SIMPSON

Ozone Nonattainment

1. **Did ALAPCO consider the enforcement costs of a Stage II program in establishing your current policy position which calls for Stage II, RVP reduction and onboard canisters? Are your members prepared to increase the local tax base to enforce such programs properly?**

If Stage II controls were implemented in the Dayton area, we would likely need to add one person to our current staff for enforcement and compliance checking. Funding of this position should be in the federal-state-local funding partnership.

NORTHEAST STATES FOR COORDINATED AIR USE MANAGEMENT
(NESCAUM)

MEMBERS

CONNECTICUT AIR COMPLIANCE UNIT
MAINE BUREAU OF AIR QUALITY CONTROL
MASSACHUSETTS DIVISION OF AIR QUALITY CONTROL
NEW HAMPSHIRE AIR RESOURCES DIVISION

NEW JERSEY BUREAU OF AIR POLLUTION CONTROL
NEW YORK DIVISION OF AIR RESOURCES
RHODE ISLAND DIVISION OF AIR RESOURCES
VERMONT AIR POLLUTION CONTROL PROGRAM

Testimony of Bruce K. Maillet
Director of the Division of Air Quality Control
of the
Massachusetts Department of Environmental Quality Engineering
on behalf of the
Northeast States for Coordinated Air Use Management
before the Senate Environment and Public Works Subcommittee on
Environmental Protection

March 26, 1987

MICHAEL J BRADLEY EXECUTIVE DIRECTOR
85 MERRIMAC STREET
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Mr. Chairman and members of the Subcommittee, my name is Bruce K. Maillet. I am the Director of the Division of Air Quality Control for the Massachusetts Department of Environmental Quality Engineering. I am here to testify on behalf of the Northeast States for Coordinated Air Use Management (NESCAUM). Accompanying me is Michael J. Bradley, Executive Director of NESCAUM. NESCAUM has worked with STAPPA/ALAPCO on the development of their ozone control position. There are many similarities between the position of STAPPA/ALAPCO and that of NESCAUM. However, because of the widespread ozone problem in the Northeast, NESCAUM would like to offer suggestions which would strengthen the STAPPA position.

NESCAUM is made up of eight air pollution control agencies in the Northeast: Connecticut, Maine, Massachusetts, New Jersey, New Hampshire, New York, Rhode Island, and Vermont. NESCAUM's purpose is to promote cooperation and coordination of air quality programs among the member states, encompassing technical and policy questions. To accomplish this, NESCAUM sponsors frequent air quality training programs, participates in national debates, and promotes a variety of research initiatives. NESCAUM appreciates the opportunity to provide the Committee with suggestions on legislative revisions to the Clean Air Act to combat ozone, a very complex and persistant air pollution problem.

As state air quality management officials, our top priority is to protect the public from exposure to unhealthy levels of air pollutants. The ozone problem presents us with a significant challenge. Most areas in the Northeast have not yet been able to attain the current health standard. In addition, recent research into ozone-related health effects indicates that the current health standard may not provide the public with a margin of safety. In light of these facts, NESCAUM recommends that Congress mandate an aggresive ozone control program whose primary goal is attainment of the health standard by a specified date in the near future.

Widespread terrestrial damage has been documented from ozone exposure at ambient concentrations well below the current health standard. Therefore, Congress should also consider establishing a secondary standard designed to protect agricultural resources and terrestrial ecosystems. To attain such a welfare standard, Congress should establish a nationally applicable ozone control program consisting of currently available mobile and stationary source control requirements.

During the past ten years, numerous industrial and vehicle-related ozone control programs were implemented throughout the northeast. In recent years, peak ozone concentrations have been reduced and the length of ozone episodes have been shorter. However, vast regions of the northeast, including both urban and rural areas, still violate the ozone National Ambient Air Quality Standard (NAAQS) during the warmer months of the year.

There are many reasons why most states in the Northeast Corridor have fallen short of attaining the ozone standard. These reasons are enumerated in Attachment A. Three of the most significant factors were:

1. Failure to recognize the important role atmospheric transport of ozone and ozone precursors plays in contributing to the nonattainment problem iun the Northeast.
2. An incomplete understanding of the complex photochemical ozone formation process. This led states to underestimate the reductions required to achieve the standard and to overestimate the reduction in ozone resulting from control measures.
3. A number of significant sources have yet to be adequately controlled. In some instances the maximum effectiveness of existing control measures has not been achieved. Under-regulated sources include gasoline marketing, gasoline volatility, numerous stationary source categories for which federal guidance is needed, architectural coatings, and other high solvent products.

NESCAUM believes that it is essential to formulate revisions to the Clean Air Act which will ensure that these past ozone control shortcomings are overcome.

Ozone and ozone precursor transport into and throughout the Northeast Corridor (Virginia to Maine) is a recognized phenomenon. Ozone transport occurs throughout the entire northeast and hinders ozone attainment efforts as far north as Acadia National Park in Maine. Long range transport of ozone and ozone precursor pollutants significantly contributes to violations of the ozone health standard in several areas of the country. Transport is also responsible for delivery of ozone at concentrations which inflict damage to forests in regions which would normally be characterized as pristine.

Transport has been documented with U.S. EPA time sequence maps. These maps illustrate the flow of the ozone plume as it moves gradually from the New York City metropolitan area up through Connecticut and into central New England. In the early morning the plume is centered over southern New England. By mid-day the plume has extended to central New England, Cape Cod and western Massachusetts. By late afternoon the episode has pushed toward northern New England. As it moves north the plume combines with other emission centers in New England. This transport process is typical throughout the Northeast Corridor during the summer momths.

A recently completed study used an urban airshed model to analyze ozone formation in the New York, New Jersey, and Connecticut metropolitan area. This analysis clearly demonstrated that, even if ozone-producing emissions were completely shut off within this tri-state area for an entire day, violations of the ozone standard would still occur in northern New Jersey due to the transport of ozone and ozone precursor pollutants from areas southwest of the tri-state area. This analysis demonstrates that there must be substantial reductions in transported pollutants if the New York City metropolitan area is ever to attain the ozone standard.

In order to overcome this transport problem, revisions to the Clean Air Act should establish a regional control process requiring a reasonable level of ozone control measures in all states or areas which significantly contribute to downwind nonattainment. The current Clean Air Act implicitly assumes that violations of the ozone NAAQS stem from emissions generated within a rather localized area. The Act provides states with mechanisms to reduce ozone precursor pollutants only within their own jurisdictions. In order to eliminate ozone violations in the Northeast and in other areas of the country where transport significantly contributes to nonattainment in a downwind state, NESCAUM recommends that ozone control regions be established and that Regional Ozone Attainment Plans be implemented.

NESCAUM recommends that Congress institute a technology-based National Ozone Control Program, rather than the modeling-based approach which exists in the current Clean Air Act. A technology-based approach would require the consistent application of increasingly stringent control measures in proportion to the severity of a region's nonattainment problem. An ozone control classification system would be established. Based on actual monitored ozone levels, each state would be assigned to one of four classification areas: attainment, moderate nonattainment, persistant nonattainment, or severe nonattainment. Each classification area would be required to implement, at a minimum, the specific list of control measures set forth in Table A.

This proposed ozone control program would establish clear roles for the U.S. Environmental Protection Agency and for state and local air quality control programs. The Environmental Protection Agency would be responsible for:

1. Implementing the following nationally applicable control measures:
   a. More stringent light-duty and heavy-duty tailpipe standards;
   b. Motor vehicle onboard vapor recovery systems;
   c. Gasoline volatility control; and
   d. regulation of highly reactive consumer and commercial products such as architectural coatings;
2. Updating existing Control Technology Guidelines (CTGs);
3. Issuing new CTGs for at least thirteen other source categories (see Attachment B);
4. Ensuring the consistent application of ozone control strategies by state and local agencies;
5. Strengthening and enforcing the Federal Motor Vehicle control program;
6. Managing the implementation of Regional Ozone Attainment Plans; and
7. Administering the National Oxidant Research and Application Program.

State and local agencies would be responsible for:

1. Developing and implementing State Ozone Attainment Plans;
2. Implementing all mandatory stationary and mobile source control measures required in each classification region;

3. Agressively enforcing the stationary and mobile source control measures;
4. Compiling an annual ozone progress report;
5. Implementing Stage II vapor recovery and enhanced vehicle inspection and maintenance programs in persistent or severe ozone nonattainment areas, and;
6. Adopting the following measures in severe ozone nonattainment areas:
   a. transportation control measures;
   b. control of smaller stationary sources; and
   c. new control measures as they become available.

Recognizing that motor vehicle-related emissions account for one-third to one-half of the ozone precursor emissions nationally, NESCAUM recommends further reducing vehicle exhaust standards, effective in 1992 for light-duty vehicles and in 1994 for heavy-duty vehicles. Furthermore, the effectiveness of the Federal Motor Vehicle Control Program should be improved by:

1. Increasing the in-factory exhaust emissions compliance rate from 50% to 90% for selective audits;
2. Integrating a short idle test into the Federal Test Procedure; and
3. Extending the warranty period for emission control devices from 50,000 to 100,000 miles.

The overall objective is to implement all available control measures in an effort to attain the ozone health standard as soon as possible. To ensure that the National Ozone Control Program is implemented as required, state and federal agencies should be held accountable for their respective responsibilities through the use of effective sanctions and mandatory backup control provisions specified by Congress.

Concurrent to the implementation of the National Ozone Control Program, NESCAUM recommends that Congress establish a National Oxidant Research and Application Program. This program's primary objective would be to develop a more precise understanding of the processes of oxidant formation and transport, to develop new and alternative control technologies, and to phase these research results into the regulatory control programs on a continuous basis. All areas classified as severe nonattainment will be required to implement the new control strategies as they are developed by the research program.

The cost of implementing all of the activities included in this National Ozone Control Program will be substantial. New resources for both state and local air quality programs, as well as for the U.S. EPA, will be essential to the success of this program.

I have attempted to suggest new regulatory mechanisms which the NESCAUM states believe will more effectively achieve the goal of ozone attainment. In so doing, I have proposed specific control measures which spread the burden among the various industrial sectors, consumers, and all areas of the country which contribute to widespread ozone nonattainment. As I stated earlier, our primary goal is protecting the public from exposure to unhealthy air pollution levels. This must remain our top priority in the development of a National Ozone Control Program. NESCAUM hopes that these comments prove useful to the Committee. We are available to assist you with this issue at any time. Thank you.

sen-testimony; 3/24/87

Attachment A

We have fallen short of attaining the standard for many reasons.

1. Control strategies for ozone were not implemented in all areas which contributed to violations of the standard. The present control program does not require control measures on sources whose emission contribute to nonattaiment via transport.

2. Modeling techniques used for estimating VOC reductions underestimated the amount of controls needed and did not account for transport of ozone from other areas.

3. Uncertainties in the chemistry of ozone formation led to overestimates of the emission reductions obtainable from control strategies. EPA's Empirical Kinetic Modeling Approach (EKMA), used to develop State Implementation Plans, under-predicted by more than 30% the emission reductions needed from stationary sources. EPA's Mobile-2,3, and 4 models for mobile sources overpredicted emission control results.

4. Economic growth in the northeast was underestimated.

5. Vehicle travel in the northeast was significantly underestimated. In fact, between 1981 and 1985 the number of vehicle miles traveled (VMT) by automobiles and trucks increased nationally by about 200 billion miles.

6. A variety of federal and state control strategies have not been fully implemented or achieved maximum effectiveness.

7. Controls on the gasoline marketing related emissions which contribute to ozone formation have not been instituted (on-board, stage II, gasoline volatility). Meanwhile, in the past few years, the volatility of gasoline has increased from 9.0 (the level EPA certifies gasoline engines) to 13.0 in some areas of the country. The NESCAUM states recently proposed to limit the Reid Vapor Pressure of gasoline to 8.0 during the ozone season. This control measure will yield an estimated 100,000 ton reduction in VOC emissions in the northeast.

8. The Federal Motor Vehical Control Program has not ensured compliance with exhaust standards for the entire useful life of a vehicle.

9. Many stationary source categories are unregulated. EPA has not adopted any Control Technique Guidelines (CTG) for over six years. States establish reasonable available control technology and set control requirements for industry based on CTGs.

oz-testify;3/24/87

Table A

SUMMARY OF CONTROL REQUIREMENTS

CLASS I	CLASS II	CLASS III	CLASS IV
Ozone attainment areas Minimum national control strategies required	Moderate Ozone nonattainment areas plus all attainment areas within an ozone control region	Persistent Ozone nonattainment areas and all areas significantly contributing to severe nonattainment downwind	Severe Ozone nonattainment areas
1992 light-duty motor vehicle emission stnds of 0.25 gpm HC and 0.4 gpm NOx	1992 light-duty motor vehicle emission stnds of 0.25 gpm HC and 0.4 gpm NOx	1992 light-duty motor vehicle emission stnds of 0.25 gpm HC and 0.4 gpm NOx	1992 light-duty motor vehicle emission stnds of 0.25 gpm HC and 0.4 gpm NOx
1994 heavy-duty vehicle emission stnds--50% reduction in HC and NOx	1994 heavy-duty vehicle emission stnds--50% reduction in HC and NOx	1994 heavy-duty vehicle emission stnds--50% reduction in HC and NOx	1994 heavy-duty vehicle emission stnds--50% reduction in HC and NOx
Onboard vapor recovery for 1991 model year	Onboard vapor recovery for 1991 model year	Onboard vapor recovery for 1991 model year	Onboard vapor recovery for 1991 model year
Gasoline volatility controls	Gasoline volatility controls	Gasoline volatility controls	Gasoline volatility controls
Low solvent/non-reactive product requirements (architectural coatings,etc)	Low solvent/non-reactive product requirements (architectural coatings,etc)	Low solvent/non-reactive product requirements (architectural coatings,etc)	Low solvent/non-reactive product requirements (architectural coatings,etc)
RACT for all VOC source categories - 100 TPY	RACT for all VOC source categories-50 TPY	RACT for all VOC source categories - 25 TPY and BART for 100 TPY	RACT for all VOC source categories - 25 TPY and BART for 50 TPY
New Source Review (NSR)-require BACT for 50 TPY VOC sources	NSR - require LAER for 50 VOC TPY sources; 1:1 offsets	NSR - require LAER for 50 TPY VOC sources; 1:1 offsets	NSR - require LAER for 50 TPY VOC sources, 2:1 offsets
NSR - require BACT for 100 TPY NOx sources	NSR - require BACT for 50 TPY NOx sources	NSR - require BACT for 50 TPY NOx sources	NSR - require BACT for 50 TPY NOx sources
No netting	No netting	No netting	No netting

CLASS I	CLASS II	CLASS III	CLASS IV
Bubbles allowed with demonstrated air quality benefit	Bubbles allowed with demonstrated air quality benefit	Bubbles allowed with demonstrated air quality benefit	No bubbles
	Anti-tampering program implemented	Anti-tampering program implemented	Anti-tampering program implemented
		Enhanced I/M program implemented	Enhanced I/M program implemented
Stage II vapor recovery for 50,000 monthly gallon throughput when underground tanks are replaced	Stage II vapor recovery for 50,000 monthly gallon throughput when underground tanks are replaced	Stage II vapor recovery for 50,000 monthly gallon throughput	Stage II vapor recovery for 20,000 monthly gallon throughput
			Transportation control measures as necessary for attainment Source specific RACT and BART Automatic application of all new and innovative controls developed by NORAP
REGULATORY PROCESS Require revisions to stationary source control regulations	Develop and implement SOAP and/or ROAP	Develop and implement SOAP and/or ROAP	Develop and implement SOAP and/or ROAP

SOAP-state ozone attainment plan

ROAP-regional ozone attainment plan

Ozone NAAQS=0.12 ppm

RACT-reasonable available control technology

BART-best available retrofit technology

BACT-best available control technology

LAER-lowest achievable emission rate

I/M-vehicle inspection and maintenance

NORAP-national oxidant research and application program

NESCAUM-3/23/87

ATTACHMENT B

NESCAUM SUGGESTED CLEAN AIR ACT AMENDMENTS FOR CONTROLLING AMBIENT OZONE LEVELS
MARCH, 1987

Summary

These proposed Clean Air Act Amendments are intended to promote a national control program which will achieve long term attainment of the ozone national ambient air quality standard within a reasonable time. An amended Clean Air Act should provide for the application of uniform control strategies in a manner which more accurately reflects the nature of the ozone problem.

This document is evolving and undergoing additional technical analysis. It is intended to illustrate the regulatory control concepts which the NESCAUM states believe are necessary to address effectively the widespread ozone nonattainment problem. This approach can be characterized by the following:

Aggressive Approach - Ozone is a persistent and complex pollutant. Recent research into health effects indicate that the current health standard may not provide a margin of safety. Widespread terrestrial damage from ozone exposure at ambient concentrations far less than the current health standard have been documented. Projected climatic changes and increased levels of ultraviolet radiation will probably exacerbate the current ozone problem. Consequently, more, rather than less control is likely to be required in the future.

Regional Nature of the Problem - In various regions of the country the atmospheric transport of ozone and ozone precursors has been clearly demonstrated. This long distance transport contributes significantly to violations of the ozone ambient standard in downwind areas. An ozone control classification system is suggested. This system would reflect the regional nature of the problem and the severity of the problem in various areas of the country. A state's ozone classification would be based on recorded ozone levels during the most recent three ozone seasons. Each state would be assigned to one of four classes: attainment, moderate nonattainment, persistent nonattainment, or severe nonattainment. Increasingly stringent ozone control measures would be required in proportion to the severity of a state's nonattainment problem. Multi-state regions would be established in areas of the country where transport contributes to nonattainment.

Technology Based Approach - A technology based approach is strongly suggested. This approach would require the consistent application of demonstrated control strategies in all areas of the country for different size sources depending on the extent of an an area's nonattainment problem and on that area's contribution to the problem in other regions. (See Table A)

Attainment Plans - The development and implementation of state ozone attainment plans (SOAPs) should be required of all states which have recorded recent violations of the ozone standard and also for all other states whose emissions significantly contribute to ozone nonattainment in a downwind state. All SOAPs should include projected attaninment demonstrations, annual progress reports, and as a minimum, the specific control measures set forth in Table A for the various ozone control classification regions. The U.S. EPA should be responsible for adopting regional ozone attainment plans (ROAPs) for all multi-state ozone control regions. All ROAPs should consist of the required SOAP control measures for those states in an ozone control region plus any additional measures needed to ensure ozone attainment throughout the region.

Air Toxics - Volatile organic compounds are recognized as ozone precursors and, in many instances, as toxic air pollutants. This proposal would establish a National Organic Substances Emission Strategy which would result in reductions in ozone and exposure to air toxics in all areas of the country.

Role of the U.S. EPA - The EPA should issue regulations on schedule, ensure the consistent application of control strategies, provide technical assistance and training to state and local agencies, and promote the development and implementation of future innovative control strategies. The creation of a congressionally appointed EPA oversight commission is suggested as a mechanism to ensure that the U.S. EPA fulfills its role.

Research - The U.S. EPA, in conjunction with other federal agencies, should develop a long term oxidant research program. The primary objectives of the research program are to develop a more precise understanding of the processes of oxidant formation and transport and to develop new and alternative control technologies. These research results should be applied to the regulatory control program on a continuous basis. However, EPA and states must move ahead with available controls while scientific research continues.

The following six research areas should be included in this national program:

1. oxidant effects- public health, terrestrial, etc.
2. oxidant formation
3. oxidant transport
4. oxidant monitoring and measurement techniques
5. control technologies
6. oxidant precursor emission inventory

Program Support - Sufficient program funds should be provided on all levels of government in order effectively to implement these ozone control amendments. The success of state and local agencies' efforts will depend upon the availability of funds to develop and implement State Ozone Attainment Plans and to support ambient monitoring, emission inventory compilation, enforcement activities, and permit reviews for both new and existing sources. The U.S. EPA should have adequate funds to develop State Ozone Attainment Plans (SOAPs) guidance, adopt Regional Ozone Attainment Plans, issue Control Technology Guidance (CTGs) documents, conduct research, and review state plans promptly.

Table A

SUMMARY OF CONTROL REQUIREMENTS

CLASS I	CLASS II	CLASS III	CLASS IV
Ozone attainment areas Minimum national control strategies required	Moderate Ozone nonattainment areas plus all attainment areas within an ozone control region	Persistent Ozone nonattainment areas and all areas significantly contributing to severe nonattainment downwind	Severe Ozone nonattainment areas
1992 light-duty motor vehicle emission stnds of 0.25 gpm HC and 0.4 gpm NOx	1992 light-duty motor vehicle emission stnds of 0.25 gpm HC and 0.4 gpm NOx	1992 light-duty motor vehicle emission stnds of 0.25 gpm HC and 0.4 gpm NOx	1992 light-duty motor vehicle emission stnds of 0.25 gpm HC and 0.4 gpm NOx
1994 heavy-duty vehicle emission stnds--50% reduction in HC and NOx	1994 heavy-duty vehicle emission stnds--50% reduction in HC and NOx	1994 heavy-duty vehicle emission stnds--50% reduction in HC and NOx	1994 heavy-duty vehicle emission stnds--50% reduction in HC and NOx
Onboard vapor recovery for 1991 model year	Onboard vapor recovery for 1991 model year	Onboard vapor recovery for 1991 model year	Onboard vapor recovery for 1991 model year
Gasoline volatility controls	Gasoline volatility controls	Gasoline volatility controls	Gasoline volatility controls
Low solvent/non-reactive product requirements (architectural coatings,etc)	Low solvent/non-reactive product requirements (architectural coatings,etc)	Low solvent/non-reactive product requirements (architectural coatings,etc)	Low solvent/non-reactive product requirements (architectural coatings,etc)
RACT for all VOC source categories - 100 TPY	RACT for all VOC source categories-50 TPY	RACT for all VOC source categories - 25 TPY and BART for 100 TPY	RACT for all VOC source categories - 25 TPY and BART for 50 TPY
New Source Review (NSR)-require BACT for 50 TPY VOC sources	NSR - require LAER for 50 VOC TPY sources, 1:1 offsets	NSR - require LAER for 50 TPY VOC sources, 1:1 offsets	NSR - require LAER for 50 TPY VOC sources, 2:1 offsets
NSR - require BACT for 100 TPY NOx sources	NSR - require BACT for 50 TPY NOx sources	NSR - require BACT for 50 TPY NOx sources	NSR - require BACT for 50 TPY NOx sources
No netting	No netting	No netting	No netting

CLASS I	CLASS II	CLASS III	CLASS IV
Bubbles allowed with demonstrated air quality benefit	Bubbles allowed with demonstrated air quality benefit	Bubbles allowed with demonstrated air quality benefit	No bubbles
	Anti-tampering program implemented	Anti-tampering program implemented	Anti-tampering program implemented
		Enhanced I/M program implemented	Enhanced I/M program implemented
Stage II vapor recovery for 50,000 monthly gallon throughput when underground tanks are replaced	Stage II vapor recovery for 50,000 monthly gallon throughput when underground tanks are replaced	Stage II vapor recovery for 50,000 monthly gallon throughput	Stage II vapor recovery for 20,000 monthly gallon throughput
			Transportation control measures as necessary for attainment Source specific RACT and BART Automatic application of all new and innovative controls developed by NORAP
REGULATORY PROCESS Require revisions to stationary source control regulations	Develop and implement SOAP and/or ROAP	Develop and implement SOAP and/or ROAP	Develop and implement SOAP and/or ROAP

SOAP-state ozone attainment plan

ROAP-regional ozone attainment plan

Ozone NAAQS=0.12 ppm

RACT-reasonable available control technology

BART-best available retrofit technology

BACT-best available control technology

LAER-lowest achievable emission rate

I/M-vehicle inspection and maintenance

NORAP-national oxidant research and application program

NESCAUM-3/23/87

NESCAUM SUGGESTED CLEAN AIR ACT AMENDMENTS FOR CONTROLLING AMBIENT OZONE LEVELS
MARCH, 1987

Section I. Ozone Classifications Regions and Attainment Plans

These proposed Clean Air Act amendments for ozone are intended to illustrate the regulatory control concepts which the NESCAUM states believe are necessary to address effectively the widespread ozone nonattainment problem. This document is evolving and undergoing additional technical analysis.

A. Ozone Classification Regions

The Clean Air Act will establish criteria for assigning all states and regions within various states to one of four classifications. The four classification areas are described below. The specific ambient ozone cutoff levels are simply intended to illustrate how each classification region would differ from the others. NESCAUM recommends that Congress select the specific ozone cutoff levels for each classification region and specify them in the Act.

1) Class I - Ozone Attainment Regions

Ozone Attainment Regions (OAR) are areas which have not recorded ozone ambient levels at a design monitor of 0.12 ppm or greater for the past three years or ozone seasons, and are not located in an ozone control region (OCR) where measured ozone levels have exceeded 0.14 ppm during the past three (3) years or ozone seasons.

2) Class II - Moderate Ozone Nonattainment Regions and Attainment Areas within Ozone Control Regions

The Class II Regions consist of areas which have recorded ozone ambient levels at a design monitor within the range of 0.12 ppm to 0.14 ppm at any monitoring site during the past three (3) years or ozone seasons and states which have not recorded ozone ambient levels of 0.12 ppm or higher during the past three (3) years or ozone seasons but are located within an OCR where measured ozone levels have exceeded 0.14 ppm during the past three (3) years or ozone seasons.

3) Class III - Persistent Ozone Nonattainment Regions

The Class III Regions consist of areas which have recorded ozone ambient levels at a design monitor greater than 0.14 ppm but not higher than 0.18 ppm during the past three (3) years or ozone seasons and all other areas which significantly contribute to levels exceeding 0.18 ppm at downwind locations. The U.S. EPA will designate ozone precursor emission regions which contribute significantly to downwind ozone levels exceeding 0.18 ppm.

4) Class IV - Severe Ozone Nonattainment Regions

The Class IV Regions consist of areas which have recorded ozone ambient levels at a design monitor exceeding 0.18 ppm during the past three (3) years or ozone seasons. This region will consist of at least the entire Consolidated Metropolitan Statistical Area (CMSA) where a monitored ozone value of greater than 0.18 ppm was recorded and appropriate adjacent upwind CMSAs as determined by the U.S. EPA.

B. State Ozone Attainment Plans (SOAPs)

1) The Amended Clean Air Act will direct the U.S. EPA to promulgate regulations for the development of State Ozone Attainment Plans (SOAPS) within nine (9) months of the passage of the act.

2) The U.S. EPA will require the submission of State Ozone Attainment Plans from all states which have Class II, III and IV Regions within twelve (12) months of issuing SOAP development regulations.

3) The State Ozone Attainment Plans (SOAPS) will include as a minimum the control measures set forth in Sections II and III for each of the classification regions. Projected attainment demonstrations will be required as part of each SOAP and will utilize conservative emission reduction projections, taking into account future economic growth and increased vehicle miles traveled.

4) All State Ozone Attainment Plans will include an annual Reasonable Further Progress (RFP) report based on a detailed emissions inventory and recent ozone ambient monitoring data.

C. Regional Ozone Attainment Plans (ROAPs)

NOTE: The current Clean Air Act implicitly assumes that violations of the Ozone National Ambient Air Quality Standard stem from emissions generated within a rather localized area. The Act only provides states with mechanisms to reduce ozone precursor emissions within their own jurisdictions. It has been clearly demonstrated in various regions of the country that the transport of ozone and ozone precursors over long distances contributes significantly to violations of the ozone ambient standard downwind. Obviously, pollutant transport does not respect state boundaries. In order effectively and equitably to eliminate violations of the ozone ambient standard, regional ozone control plans must be implemented. Sources within the entire geographic region which significantly contribute to the nonattainment problem must reduce ozone precursor emissions.

1) Ozone Control Regions should be established in the Clean Air Act and consist of the entire airsheds with recorded ambient ozone levels above 0.14 ppm and encompass all areas which emit ozone precursor emissions contributing to ozone violations of this magnitude. For example, the Northeast OCR would include the following 15 jurisdictions: North Carolina, Virginia, Maryland, Washington D.C., Delaware, Pennsylvania, West Virginia, New Jersey, New York, Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, and Maine.

(a) The U.S. EPA will be designated the authority to expand or reduce the size of an OCR. The basis for such revisions must include a technically rigorous analysis which utilizes the most appropriate oxidant formation/transport models and refined emission inventories.

(b) States have the option of petitioning the U.S. EPA to revise, by expanding or reducing, the size of an OCR. In response to a state petition, the U.S. EPA must make a preliminary determination utilizing the technically rigorous analysis cited in (a) above within twelve (12) months. Following a three (3) month public comment period, final determinations must be issued within eighteen (18) months following the submission of a petition.

2) The U.S. EPA will be responsible for adopting Regional Ozone Attainment Plans (ROAPs) for all multi-state ozone control regions. All ROAPs will consist of at least the required control measures incorporated into the various State Ozone Attainment Plans (SOAPs) of the states located within an OCR. The U.S. EPA will ensure the consistent application of all Class II, III and IV control measures throughout all OCRs.

3) Working in a partnership with the affected states, the U.S. EPA will develop a regional attainment demonstration for each OCR. The regional attainment demonstration will consist of at least the ozone reduction strategies contained in each of the State Ozone Attainment Plans (SOAPs) from the states which are included in an OCR. If a regional attainment demonstration utilizing the appropriate SOAP reduction strategies fails to predict attainment throughout the OCR by the required attainment date, the U.S. EPA will issue new ozone control regulations within six (6) months which would result in region-wide ozone precursor emission reductions.

Section II. National Organic Substances Emission Strategies

A. Gasoline Volatility Limitations

The U.S. EPA will, within twelve (12) months of the passage of the Act:

1) Establish a national gasoline volatility control program which sets seasonal Reid Vapor Pressure limitations minimizing volatilized emissions.

2) Establish national fuel specific volatility limits for diesel fuel and other fuel mixtures to ensure that volatile organic emissions from these fuels remain at the lowest feasible levels.

B. National Stationary Source Control Technology Guideline Program

This program will issue stationary source Control Technology Guidelines within twelve (12) months for all source categories set forth in B. 1)-4). If EPA fails to issue these guidelines on schedule, then all source categories for which such guidance is not issued will be required to make the following percent reductions within twelve (12) months: all

RACT sources- 80% VOC reductions and all BART sources- 90% VOC reductions.

1) Reasonable Available Control Technology (RACT) for the specific source categories cited in 4) below with annual VOC emissions in the following three (3) source sizes: over 100 tons, 50 to 100 tons, and 25 to 50 tons.

2) Best Available Retrofit Technology (BART) for the specific source categories cited in 4) below of annual VOC emissions for source sizes of over 100 tons and 50 to 100 tons.

3) All RACT and BART Guidelines will be developed in a format which will:

(a) Establish emission limitations which set source emission caps.
(b) Establish source compliance requirements which enhance the effectiveness of source inspections and other compliance determination techniques.

4) The source categories for which RACT and BART guidelines will be developed consistent with Section II B. 1) - 3) include:

(a) Revision of all existing RACT categories
(b) Wood furniture coating
(c) Metal rolling
(d) SOCMI distillation
(e) SOCMI batch process
(f) Coke oven by-product plants
(g) Treatment storage and disposal facilities
(h) Bakeries
(i) Wastewater treatment works
(j) Web offset lithography
(k) Plastics parts coating
(l) Oil and gas production
(m) Marine vessels, including off-loading fuel
(n) All other source categories which emit 1% or greater of the total stationary source VOC emissions within any one ozone control region.

C. Regulations for Low Solvent or Non-Reactive Products

The U.S. EPA will establish a national program to require, where technically feasible, the development and application of lower solvent or non-reactive substitute products to replace high solvent products in the marketplace and otherwise to promote the same through various product research incentives. National low solvent requirements will be adopted and implemented for at least the following categories, within twelve (12) months of the passage of the Act:

1) Architectural coatings
2) Commercial solvents
3) Consumer solvents

4) Traffic paint
5) Autobody refinishing

D. National BACT for New Sources

The U.S. EPA will establish a national Best Available Control Technology (BACT) requirement for all new (50 TPY) or modified (50 TPY) VOC sources and issue regulations within twelve (12) months of the passage of the Act.

E. Onboard Vapor Recovery

The U.S. EPA will require the installation of onboard vapor recovery devices on all light duty vehicles beginning with the 1991 model year.

F. National Vehicle Exhaust Standards

The U.S. EPA will establish the following standards:

1) Gasoline-fueled light duty vehicles (trucks and automobiles) for the 1992 model year for the following pollutants:

Hydrocarbons	0.25 grams per mile
Nitrogen Oxides	0.4 grams per mile
Carbon Monoxide	3.4 grams per mile retained

2) Diesel-fueled light duty vehicles (trucks and automobiles) and heavy duty vehicles (trucks and buses):

(a) evaluate more stringent nitrogen oxide standards, and
(b) impose such standards if determined to be technically feasible.

3) Gasoline-fueled heavy duty vehicles (trucks and buses):

(a) revise emission standards for hydrocarbons to lowest level technically feasible,
(b) evaluate more stringent nitrogen oxide standards, and
(c) impose such standards if determined to be technically feasible.

G. Upgrade the Motor Vehicle Emissions Control Program

The U.S. EPA will require:

1) an increase in the statistical reliability for light duty vehicles by requiring a 90% in-factory exhaust emissions compliance rate during the selective audits.

2) Integration of a short (idle) test into the Federal Test Procedure to increase the effectiveness of inspection and maintenance programs.

3) Extension of the warranty period for emission control devices from 50,000 miles to 100,000 miles and revision of the Federal Test Procedure to require vehicle emission control durability testing at 100,000 miles rather than 50,000 miles.

4) Development and installment of a light duty in-vehicle service module, beginning with the 1994 model year, consisting of a computerized hook-up for inspection and maintenance programs which will test all vehicle components affecting exhaust emission levels.

Section III. State Ozone Attainment Plan Control Requirements

State ozone attainment plans will:

A. Apply Reasonable Available Control Technology (RACT) for volatile organic compound (VOC) emissions as follows:

1) Class II Areas - All 50 ton or greater per year sources
2) Class III Areas - All 25 to 50 ton per year sources
3) Class IV Areas - All 25 to 50 ton per year sources

B. Apply Best Available Retrofit Technology (BART) for VOC sources as follows:

1) Class III Areas - All 100 ton or greater per year sources
2) Class IV Areas - All 50 ton or greater per year sources

C. Apply Lowest Achievable Emission Rate (LAER) for new and modified VOC sources as follows:

1) Class II Areas - All 50 ton or greater per year sources
2) Class III Areas - All 50 ton or greater per year sources
3) Class IV Areas - All 25 ton or greater per year sources

D. Require sources to acquire emission offsets for all new and modified VOC sources which must install LAER or RACT as follows:

1) Class II Areas - Equivalent offsets
2) Class III Areas - Equivalent offsets
3) Class IV Areas - 2:1 offsets for air quality benefits

E. Require that Stage II Vapor Recovery Systems be installed at gasoline retail outlets as follows:

1) Class I and Class II Areas: Gasoline retail outlets with an annual monthly average throughput of 50,000 gallons where underground storage tanks are being replaced.

2) Class III Areas: Gasoline retail outlets with an annual average monthly throughput of 50,000 gallons or more.

3) Class IV Areas: Gasoline retail outlets with an annual average monthly throughput of 20,000 gallons or more.

F. Require that light-duty motor vehicle inspection programs consist of the following:

1) Class II Areas:

(a) Comprehensve anti-tampering inspection.

2) Class III and IV Areas:

(a) Comprehensive anti-tampering inspection,
(b) Enhanced tailpipe exhaust emissions test for hydrocarbons, nitrogen oxides, and carbon monoxide, and
(c) An inspection of the on-board vapor recovery systems.

G. Require Best Available Control Technology for nitrogen oxide(s) emissions for all 50 ton per year sources, new or modified, in all Class II, III and IV areas.

H. Implement the following additional measures in both Class III and Class IV Areas if all other National and SOAP reduction strategies fail to predict attainment with the ozone NAAQS (0.12 ppm) by the required deadline:

1) Develop and apply BART and RACT on source categories not included in the National Source Control Technology Guidline Program (see Section II B.).

2) Apply each new or innovative VOC control measures as they are developed by the National Oxidant Research and Application Program (see Section VII).

3) Also implement new or innovative VOC control measures implemented by other State and Local Air Quality Management Agencies or by other organizations.

4) Review and implement all feasible long-term Transportation Control Measures (TCMs) which will result in reduced ozone precursor emissions.

5) Institute state and local legislative measures to ensure that air quality impacts associated with transportation planning (highways, parking policies, mass transit, impacts on traffic flow and capacity, etc.) are afforded a high priority and that predicted negative air quality impacts are mitigated or offset.

6) Implement more stringent stationary source NO_x controls in areas where the National Oxidant Research and Application Program's oxidant modeling effort demonstrates the need for such controls.

I. Prohibit facility VOC Bubbles in Class IV Areas but allow them in Class I, ~~II~~ and III areas if the following conditions are met:

1) All VOC emission increases within a facility bubble are offset at a rate of 2.0 to 1.0 to ensure an air quality benefit.

2) The area in which a source is located has developed an acceptable attainment demonstration, is implementing SOAP and ROAP control strategies on schedule, and has submitted an acceptable Reasonable Further Progress report for the previous year.

3) All VOC emission limitations are readily enforceable.

J. Prohibit netting out of New Source Review on a national basis.

Section IV. Attainment Deadlines and Sanctions

A. Congress should establish realistic ozone attaiment deadlines which vary in accordance with the severity of a region's ozone nonattainment problem. Most moderate ozone nonattainment regions should be capable of attaining the ozone standard within a few years while it may require several additional years for a few nonattainment regions to attain the standard.

B. The sanctions contained in the Clean Air Act for nonattainment of an NAAQS by a mandatory deadline will be retained, with the exception of automatically curtailing federal 105 grant support to state and local air quality management agencies. Curtailment of 105 grant support will be instituted only if the U.S. EPA demonstrates that nonattainment is the result of state or local agency non-performance, or refusal to adequately implement the requirements of the Clean Air Act. If 105 funds are withheld from a state, EPA must use those funds to implement the program elements in which that state has been judged to be deficient.

Section V. Interstate Transport

A. Section 126 of the current Clean Air Act should be revised to include all types of air pollution sources, including area sources. The combined impact from many sources in one state on another state via atmospheric transport should be recognized in the Act as a basis for legal action.

Section VI. National Commission on Air Quality (NCAQ)

A. Congress should reestablish the National Commission on Air Quality (NCAQ) to act as an oversight authority to ensure that the U.S. EPA is administering the ozone attainment program in conformance with congressional intent as stipulated in the new Clean Air Act Amendments.

Every six (6) months, the NCAQ will monitor the progress of implementing the required control programs, review the federal ozone research program, make recommendations on proposed revisions to ozone control regions, and assess the adequacy of technical assistance and training. The NCAQ will provide Congress with an annual ozone control program audit report which assesses state and local agency and EPA performance, highlights research findings, and recommends necessary program revisions and funding levels.

Section VII. National Oxidant Research and Application Program

A. The U.S. EPA, in conjunction with other federal agencies (e.g., the National Oceanic and Atmospheric Administration (NOAA)) will develop a long term oxidant research program. The research program's primary objectives are to develop a more precise understanding of the oxidant formation and transport processes, to develop new and alternative control technologies, and to appropriately apply these research results to the regulatory control program on a continuous basis. The following six research areas should be included in this national program:

1) Oxidant Effects: evaluate the direct effects of ozone and other oxidants as well as effects resulting from the combination of oxidant and other air contaminants on:

(a) public health, both short-term and long-term impacts,
(b) terrestrial ecosystems, including crops, and high altitude forests- (enhance the National Crop Loss Assessment Network), and
(c) building materials, cultural resources, and other man-made materials and resources- (establish a cooperative network between industry research and environmental protection).

2) Oxidant Precursor Emission Inventory:

(a) compile extensive 1988, 1990, 1992 national emission inventories for all oxidant precursor emissions including all reactive hydrocarbon species and oxides of nitrogen emitted from stationary, mobile, area, and natural sources.

3) Oxidant Monitoring and Measurement Techniques:

(a) implement a comprehensive oxidant and oxidant precursor ambient monitoring program across the country for both rural and urban areas, and
(b) improve oxidant sampling and measurement techniques.

4) Oxidant Formation:

(a) research into oxidant formation and atmospheric chemistry, including the role of nitrogen oxides and various hydrocarbon species in promoting ozone formation,
(b) identify all significant sources of ozone precursors including natural sources,
(c) recommend appropriate adjustments to the ongoing ozone reduction programs,
(d) evaluate the role oxidants play in promoting acidic deposition and other greenhouse effects, and evaluate stratospheric ozone depletion effects on tropospheric ozone formation.

5) Oxidant Transport:

(a) develop reliable oxidant transport models to simulate the long distance atmospheric transport of ozone precursors and other oxidants,
(b) utilize these models to identify source regions and associated impacts in both urban and rural locations, and
(c) recommend appropriate adjustments to the ongoing ozone reduction programs.

6) Control Technologies:

(a) develop and demonstrate new VOC and NO_x emission control technologies for stationary sources, area sources and mobile sources, and
(b) develop and demonstrate alternative and innovative non-reactive products to replace high solvent content products.

roaps; 3/17/87

Presentation by

James M. Lents, Ph.D., Executive Officer,

South Coast Air Quality Management District

Before The

Senate Subcommittee on Environmental Protection

Washington, D.C.
Dirksen Building
Room 406

State and Local Government Control Efforts in Nonattainment Areas

March 26, 1987
9:30 a.m.

Mr. Chairman, Members of the Committee, I am James Lents, Executive Officer of the South Coast Air Quality Management District. My comments will focus primarily on the South Coast Air Basin in California, a severe nonattainment area for ozone, carbon monoxide, and particulates.

Overall, I believe the Clean Air Act has served well to improve air quality. Since 1978, peak ozone levels have decreased by 16% in Los Angeles and exposure to episode levels of ozone has decreased by 57%. However, it is a fact that we in the South Coast Basin, along with many others, will not achieve the standards that the Act requires by December 31, 1987. Thus we again must face the issue of designing a program to clean up our metropolitan air. To develop a post-1987 law, I suggest we look back at the existing Clean Air Act and ask ourselves why the 1977 amendments did not get the job done.

The 1977 amendments contained unrealistic deadlines for the South Coast Air Basin. Emissions in the Basin were and are so great that even if, theoretically, all industrial sources of air pollution had been removed from the Basin, the ozone standard would still have been violated. Similarly, the removal of all mobile sources from the Basin would not allow for attainment of the standard. Between 1977 and 1987, only a concurrent 83% emissions reduction from mobile and stationary sources would have gotten the job done. It was technologically impossible to achieve that degree of reduction by 1987.

While I certainly support ambitious air quality goals, the selection of unobtainable goals has detrimental effects on the clean-up process. Unobtainable goals, by definition, spell failure and frustration to local decision-makers because they assure a shortfall regardless of the effort made or the technology used. Similarly, oversight agencies such as the EPA and the California Air Resources Board sense the futility of forcing the implementation of plans which demonstrate attainment and, therefore, back away from vigorous enforcement. In addition, unrealistic deadlines result in an inordinate focus on what can be done today at the expense of developing much-needed longer-range control programs.

Federal laws require close and timely interactions between local jurisdictions and their state and federal counterparts. This has not taken place in the past. In fact, it has been a very distant relationship between the South Coast District, the CARB and the EPA. The rulemaking and State Implementation Plan development process require immediate, real-time decisions from local policymakers. Today the federal and state input into the process often takes months, even years. This leads to after-the-fact exceptions, months--sometimes years--later, by the EPA to what are well-intentioned rule changes. The result is unnecessary confrontations, wrong signals to our regulated community, and a waste of precious time.

Finally, local agencies often are distracted from their ultimate clean air goals by today's long-drawn-out piece-meal rulemaking process. Industries and automobile manufacturers play their cards close to the vest and are allowed repeated opportunities to mitigate rules as these move through the complex rulemaking process. Essentially, the present process provides only an incentive to beat the system, not one to make it work.

Simply delaying attainment dates will not solve the problem. A number of changes must be made to the Clean Air Act in order to ensure progress. For areas with less severe problems, I support the STAPPA/ALAPCO proposals. I offer the following recommendations for the more severe non-attainment areas.

- Establish a system of realistic, but ambitious five-year emissions reduction increments with federal overview to include the imposition of appropriate sanctions for failure to meet these goals. Require regular demonstrations of progress with immediate federal action if the progress is not achieved.
- Direct the EPA to track the plan development and rulemaking activities of a given area, such as the South Coast Air Basin, on a real-time basis, not months or years later. This presupposes that appropriate staff resources will be made available.
- Require that the New Source Review process result in an emissions decrease from all new sources. The federal program looks only at offsetting major source growth. In Los Angeles, there has been significant growth in emissions due to smaller new sources. The latter are smaller than the District's threshold which, itself, is much stricter than the federal cutoff. Had only the federal program been in place the emissions increase would have been much greater. The program needs to be structured nationally to address the issue of how to handle small sources which have limited ability to secure offsets.
- All existing sources should apply best available retrofit controls and that technology should be reviewed every five years. The EPA could provide a valuable service in helping agencies determine what are the best available retrofit controls by researching state and local programs, as well as international technology, and making this information broadly available.
- An emissions fee system needs to be developed that imposes some cost on those whose efforts result in weaker rules and hence become higher emitters. By setting realistic fees, one could discourage sources from evading control requirements. The fees could then be used to support control efforts and the furtherance of emissions control technology.
- Require that transportation growth issues be addressed, and fully accounted for, in the incremental progress reports. If emission growth occurs due to increased driving, a local area must find ways to immediately offset this growth.
- Require federal, state, and local agencies to adopt programs that will insure that by 1995 total in-use tailpipe emissions from vehicles be no more than 25 percent above those emissions that would be expected if design standards had been met. At the present, vehicles in use typically emit at least twice the emissions certified by the manufacturers. A combination of control system durability requirements, on-board diagnostics, and improved local inspection programs could attain this goal.
- Require, by 1994, mobile source standards within the following ranges:

	ROG	CO	NOx	PAR)
	(GMS/MILE)	(GMS/MILE)	(GMS/MILE)	(GMS/MILE)
LIGHT-DUTY VEHICLES	.2-.3	3-4	.3-.5	.06-.09
MEDIUM-DUTY TRUCKS	.2-.4	3-5	.3-.6	.06-.1
	(GMS/BHP)	(GMS/BHP)	(GMS/BHP)	(GMS/BHP)
HEAVY-DUTY TRUCKS	1-1.3	12-15.5	4-5	.09-.1

- Require that per-vehicle hydrocarbon emissions be reduced after 1994 by at least 3 percent per year, but allow a credit for the introduction of methanol-, electric-, and other clean-fueled vehicles.

- Allow for innovative demonstration programs that create equivalent emissions reductions or have the potential to make significant future reductions, but may not conform exactly to the Clean Air Act specifications. This will necessitate encouragement of some experimentation and may require changing the fundamental control approach found in the Clean Air Act for severely polluted areas.

Mr. Chairman and Members of the Committee, that concludes my testimony. I would be happy to answer any questions.

WRITTEN STATEMENT OF HARVEY W. SCHULTZ, COMMISSIONER
NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
SUBMITTED TO ENVIRONMENTAL PROTECTION SUBCOMMITTEE
SENATE ENVIRONMENT COMMITTEE

March 26, 1987

Thank you for the opportunity to address the committee on the issue of vital importance to the City and the country of carbon monoxide and ozone nonattainment. We are at a critical juncture where we as a city have been afforded an historic opportunity to provide for meaningful environmental success. We have the opportunity to encourage fundamental shifts in lifestyle that will guarantee the City's ability to continue to grow and enjoy economic viability.

We believe the city has acted in good faith and in a fashion entirely consistent with the Clean Air Act. As stated by the EPA Administrator, Lee Thomas, "the Act will have to be amended and the problem of post 1987 non-attainment will inevitably be one of the issues addressed in those amendments." This is because in its present form the Act, and its legislative history, do no clearly address the inability of all reasonably available control measures to bring about attainment in an area by the deadline. On its face the Act appears to force a choice between drastic transportation controls with severe economic consequences or the imposition of sanctions including moratoria on construction or modification of new emitting sources. There is however also support in the statute for the position that the sanctions are not intended to punish states and localities that, despite good faith efforts, cannot bring about attainment.

While we are doing everything we can towards meeting the Clean Air Act standards for carbon monoxide (CO) and ozone, we are concerned about our ability to reach these goals. We have begun to plan extra effort programs which we hope will assist in lowering carbon monoxide, reactive hydrocarbons and particulate emissions. In fact, the City has begun to define two distinct work plans, one to address ozone reducing strategies and the other carbon monoxide emissions reduction initiatives by 12/31/87. .

As you can see, both these plans will require some time to implement. I hope this information will be useful to the Committee in fashioning appropriate amendments to the Clean Air Act extending the ozone and carbon monoxide programs past the current 1987 deadline for those many communities which, despite good faith efforts, have not yet reached attainment. As you know, the City of New York has an overriding concern that Congress deal with this issue in a timely fashion. Let me briefly summarize the City's effort's to date to come into compliance with both CO and Ozone deadlines and what further actions will be necessary on the city, state and federal level.

CARBON MONOXIDE

Our efforts in CO have included Implementation of a State-wide Inspection and Maintenance Program, the City's Taxi Inspection Program, and a host of Traffic Control measures.

A. INSPECTION AND MAINTENANCE PROGRAM

1. All cars and light duty trucks registered in the 9-county New York Metropolitan area must be tested for exhaust emissions (hydrocarbons and carbon monoxide) annually. The goal of the program is a 25% reduction in carbon monoxide and hydrocarbons in the air by 1987. The program has indeed resulted in a significant decrease in auto emissions.

2. New York City has implemented a thrice annual inspection program for medallion taxis to respond to the rapid accumulation of mileage per time interval as compared to a passenger car. This strategy is aimed at addressing several carbon monoxide "hot spot" problems as well as a means of reducing hydrocarbon emissions in areas where taxis are responsible for a large percentage of the vehicle miles travelled and resultant emissions. The City operates a state of the art vehicle inspection facility at a cost to NYC of $1.05 million annually. This program has been extremely effective and is recognized by EPA for its fine work.

B. TRAFFIC CONTROL

Our traffic control measures include:

1. Enforcement
The City has over 2,000 traffic enforcement agents city-wide of which 417 are in the mid-town area. These agents have been extremely effective at increasing vehicular speeds and thereby reducing CO emissions. The cost to the City is approximately $31 million annually.

2. Computerization of Manhattan's Traffic Signals
The City is in the process of installing equipment which will electronically survey traffic conditions at 3,400 intersections in Manhattan and adjust signal timing

accordingly. This system is 20% completed and final completion is expected in Spring 1989 at a cost of $29.7 million.

3. Transitways, Signs and Markings
   The City has instituted transitways to provide for priority status for buses and taxis, and restrictions on truck deliveries.

   One such transitway is in operation and a second major transitway is under study. These are effective at unclogging streets and encouraging public transit ridership. Annual cost are approximately $500,000.

4. Capital Construction - The City's Capital Program which is designed to improve traffic flow in heavily congested areas of the City is currently committed to the expenditure of $140 million.

5. Mass Transit - The City is doing everything it can to work in cooperation with the MTA in an effort to increase transit ridership. The MTA's current Capital Program will cost 17 billion dollars. In addition the City also provides an annual operating subsidy to the TA and private bus operations. This was $412 million in calendar year 1987.

PROGRESS IN MEETING CO GOALS

Reviewing the historical carbon monoxide data in NYC, we see a trend that is indicative of the benefits that have been gained from the implementation of the State's Inspection and Maintenance Program, the City's Taxi Inspection Program and the City's Traffic Control measures. Although the Air Quality data is limited as a result of the small number of air monitoring stations that are run by the State (a total of 4 station), we see that peak values at monitoring stations have decreased significantly since 1984 and perhaps more importantly the number of days with 8 hour concentrations above the 9 ppm standard has dropped from a high of 31 days in 1984 to 6 in 1985. A large part of this is the result of our ability through traffic enforcement to maintain average speeds on streets above 5 mph, and on avenues above 9 mph.

The SIP was designed to provide for better traffic management to reduce congestion and increase speeds. These traffic measures have in fact been extremely effective in increasing speeds and thereby increasing capacity. Unfortunately as the traffic moved more freely, more cars were attracted which in turn once again reduced capacity. Ironically our success has proved to be our failure.

Although our modeling efforts project non-compliance at a number of locations in Manhattan's Central Business District (CBD), and newly developing business districts in Brooklyn and Queens, the majority of the 5 boroughs of NYC have already been brought into compliance.

We feel that the air quality model needed to evaluate these sites that have a particularly urban topography, characterized by high street walls, is overly conservative and may be predicting concentrations greater than those actually occuring. While this is the best available tool at the present, we are aware of its limitations. We therefore are pursuing a study to calibrate this model using current traffic data which would be collected at sites where modeling results are in question.

FUTURE WORK ON CO

As we approach the 1987 deadline the City is expending enormous energy in an attempt to develop additional extra efforts programs designed to achieve compliance. While we feel that they may not be able to provide for compliance by January 1,1988, we feel that if such efforts are tied to a deadline extension, the goals of the Clean Air Act will be achieved as expeditiously as possible, without needlessly jeopardizing the economic vitality of our City.

The City is pursuing two types of solutions, one is a Traffic Control solution and the other is what I might call Tailpipe Solutions:

1. Traffic Solutions

   Our carbon monoxide reduction strategies are linked to our independent goal to implement a regional transportation plan. While we are working with City and State transportation agencies in defining this broader goal, we understand that the solution to the City's localized carbon monoxide exceedances may require limiting vehicle access in those areas. We believe this type of strategy may require economic penalties, such as a user fee, in order to be effective.

   The City is evaluating an expanded number of strategies that would result in the reduction of vehicles in our most congested area, the Manhattan CBD, Downtown Brooklyn and Long Island City. Strategies under review include, congestion pricing, ban of single vehicle entry, limited weekly access to the Central Business District, prohibitations of truck movement, heavy fines and reduction of vehicle subsedies by employers.

We believe that with one or more of these strategies, we can achieve compliance with the CO standard. We also recognize that due to some street configurations in Manhattan, an area wide vehicle reduction strategy will not assure total compliance, and that very site specific measures designed for a specific result, such as prohibiting trucks on certain streets, will be necessary to achieve compliance.

2. Tailpipe Solutions
Based on our preliminary research we believe that methanol and compressed natural gas (CNG) burn cleaner than gasoline and that the automotive technology is being developed to assure that a methanol or CNG engine meets the reliability, durability and drivability standards of the gasoline powered engine. We will be embarking on a major experimental program to test alternative fueled fleet vehicles. We believe that CO benefits may not be as great as those achieved in ozone and particulates, but that the reductions will be significant.

We will also continue to work with NY State to achieve the best possible inspection and maintenance program.

OZONE

Since the early 1970's the city has been enforcing local air pollution control laws which control emissions of ozone precursors. DEP inspects industrial facilities for compliance with State and city regulations for the control of various volatile organic compounds used in many production processes. In 1986, 1,700 industrial facility enforcement inspections were conducted by DEP for noncompliance with permitting requirements. These inspections resulted in the issuance of over 1,000 notices of air code violations and subsequent remediation.

DEP has work extremely closely with the dry cleaning and graphic arts industries in New York City, through their local trade associations. We have stressed the importance of compliance with the VOC chemical formulation and ancillary equipment standards required to reduce ozone levels in the city.

As part of our SIP commitments we have also implemented Reasonably Available Measures including:

A) Implementation of Stage I Vapor Recovery - Regulations requiring controls to prevent vapor escape from gasoline delivery operations to the tanks have been in place for several years.

B) Upgrading of the inspection and maintenance program for light-duty trucks to include an increase in the pass/fail standards to a 30% stringency level, a two-speed idle test for all 1981 and newer model years and an anti-tampering inspection.

C) Tightening of RACT for Stationary Sources - The size of the sources coming under regulation was reduced from any source having an emission rate potential greater than or equal to 10.0 lb/hr to 3.5 lb/hr.

Ambient ozone levels have shown significant decreases. The number of days that the ozone standard was exceeded in 1984 and 1985 was 53% less than in 1983.

We recognize that the ozone problem is more difficult to resolve as we are dealing with the cumulative emissions of sources in the larger geographic area of New York, New Jersey and Connecticut and beyond. In fact an EPA/State of New York Study (now in draft) shows that even with the full SIP (including fully implemented Stage II vapor controls) and a host of other extraordinary measures in place in the tri-state area, predictions are that the ozone standard would be difficult if not impossible to achieve by the summer of 1988, in Northern N.J., N.Y. City and Connecticut.

However we are working with New York State Department of Environmental Conservation to continue efforts to bring the area into compliance. We feel the State must play the principal role in the regional problem.

FUTURE WORK ON OZONE

First, all the strategies called for in the SIP have not yet been implemented.

In particular, Stage II Vapor Recovery regulations have not yet been promulgated by the State. In recent state hearings on proposed Stage II regulations, the City strongly urged the adoption of such controls. Until all the strategies are in effect, we will not be able to demonstrate attainment.

Second, the implementation of control strategies by upwind communities in large part determines the ambient levels in the City. We are therefore dependent on other jurisdictions to achieve attainment.

Additionally many of the remaining strategies (e.g. on board canisters for vehicles and reformulation of consumer products) must be national in scope; they can not be implemented in specific areas.

We feel the most fruitful things that the city can contribute to the state's efforts in ozone are continuation of our vigorous enforcement efforts for stationary sources including gasoline stations, and the alternative fuel demonstration program I mentioned before. We feel the alternative fuel program has significant promise for fleet vehicles and with Federal support perhaps also great promise, for general fuel replacement for many vehicles in the future.

WHERE DO WE GO FROM HERE

Based on the foregoing and our own analysis of the statutory scheme, we can identify a few areas where it would be profitable for the Congress to concentrate its attention in fashioning a post-1987 program for carbon monoxide and ozone in the context of a deadline extension coupled with appropriate measures to insure continued progress toward attainment:

- enhanced inspection and maintenance programs including a test for the presence of lead in the tailpipe of cars equipped with catalytic converters;
- improved ambient air monitoring as a productive investment in clean air which can result in more effective strategies for reaching attainment and in a system for monitoring long-term compliance once attainment is reached.
- funding for alternative fuels research and implementation;
- funding for increased basic research regarding ozone formation and transport;
- continued funding for mass transit.

In addition, Congress should help bring about a prompt resolution, based on sound technical decisions, on the following:

- on board vapor recovery systems;
- reduced volatility standards for gasoline; and
- technology-based control strategies for ozone control which deal with the regional nature of ozone formation.

In addition, we feel that Congress may have to examine the existing Clean Air Act mechanism for attaining ambient air quality standards in dealing with the regional nature of the ozone problem. It does not appear that the existing mechanism of state-by-state plans is adequate to address the problem and bring about the results we both desire. We would like to have the Northeast Corridor be treated as one air quality basin in order to address the critical role that upwind area transport of ozone and its precursors play in nonattainment in our region.

Thank you for the opportunity to testify on this very important subject.

THE CITY OF NEW YORK
OFFICE OF THE MAYOR
NEW YORK, N.Y. 10007

March 27, 1987

Hon. John D. Dingell
Chairman
Committee on Energy and Commerce
2123 Rayburn House Office Building
Washington, D.C. 20515

Dear John:

I received your letter of March 3, 1987 and appreciate this opportunity to continue our dialogue about the December 31, 1987 deadlines for complying with the Clean Air Act, and to respond to your question about the STAPPA/ALAPCO and NESCAUM proposals.

In general, STAPPA/ALAPCO represents air program administrators and officials. It is altogether appropriate that air program administrators have organizations to represent their concerns, and we do not in any way question the legitimacy of their efforts. It is important that air program administrators have a forum in which to "vote their conscience" on air quality issues without the need to reconcile air quality goals with other public policy objectives. The groups have done very useful work in this regard. However, Congress should not conclude that it has received the views of elected officials until it has heard from groups like the United States Conference of Mayors, the National League of Cities, and the National Association of Counties.

In general, the City supports STAPPA/ALAPCO's efforts. Their policy combines deadline relief with additional steps that should be taken by areas of the country that have not yet reached attainment. Air quality goals are not compromised, and additional progress toward meeting these goals is required. Sanctions are limited to areas that fail to try, not areas that try but fail. The City supports this approach.

There are a few areas, however, where the concerns of New York City go beyond the issues addressed by STAPPA/ALAPCO's policy.

The City has an overriding concern not just for amendments to the Clean Air Act dealing with post-1987 non-attainment, but for such amendments to be passed as soon as possible and certainly prior to the end of this year.

As we discussed during our meeting on February 18, I am extremely concerned about New York City's ability to attain the Act's standard for ozone and carbon monoxide by year's end, even with the implementation of all reasonable available technology. Nonetheless, the City is continuing to seek additional measures that will bring it into compliance with the ozone and carbon monoxide standards as quickly as possible because of our commitment to provide a healthy environment for all New Yorkers.

But we are concerned by the fact that the Clean Air Act stops short of addressing the situation of non-attainment after December 31. Unless Congress amends the Act to correct this shortcoming before that date, most of the nation's cities will confront the prospect of sanctions and law suits that could seriously disrupt their economies. This problem is not limited to a few major cities like Detroit, New York, and Los Angeles. EPA data indicates that 56 of the nation's largest metropolitan areas have air pollution problems that may not be resolved by the end of this year, in time to meet the deadline.

The sanctions that these cities could face if Congress fails to act on the deadlines include cutoffs of federal grants for highway improvements and wastewater treatment plants, plus the possibility of federal court injunctions against new development and industrial revitalization projects. Such sanctions may have merit when applied against local governments that refuse to implement air quality improvement strategies within their authority, but the penalties prescribed by the Clean Air Act do not take into account the fact that many local governments in non-attainment areas have already utilized all reasonable measures legally available to them. They either have no authority to act further, or could do so only at the risk of imposing serious economic hardship on their citizens and business firms.

Another danger faced by cities if Congress fails to act in time on the Clean Air Act deadlines is the opportunity this creates for federal court suits by plaintiffs using the Clean Air Act as a legal argument for blocking public and private projects that they oppose for whatever reason.

If Congress does not replace the deadlines before the end of this year, cities around the country may expect to be faced with many lawsuits by individuals and groups opposing new industrial projects, resource recovery plants and other development projects.

Second, STAPPA/ALAPCO's policy is silent on carbon monoxide. While many of the steps called for in STAPPA/ALAPCO's policy would produce improvements in carbon monoxide, the policy neglects to address the carbon monoxide issue directly, or to highlight the necessity for deadline relief. Congress must not lose sight of the carbon monoxide problem and the need to deal with the carbon monoxide deadline issue this year.

Federal, state, and local government had all agreed to our current SIP Control Program for carbon monoxide, which focused on hotspots. While there has been clear progress in achieving CO standards, we are having difficulty meeting our goal. In discussions with EPA it has become clear that our basis for solutions may need to be re-evaluated. We ask Congress to be mindful of the City's particular needs and fashion legislative solutions which will be meaningful in attaining clean air.

Third, we have major concerns about the effect of the deadlines on the City's plans to build resource recovery plants. Like many other cities, New York is facing a solid waste crisis. Sanitary land fill capacity is rapidly disappearing and resource recovery may be the only environmentally acceptable alternative. It is not clear what effect STAPPA/ALAPCO's policy would have on the City's plants. The issues raised are still being analyzed. Item 8.2 of the City's Legislative Program, entitled "Clean Air Act -- Growth Allowances" was motivated by our plans for resource recovery plants and is there to point out that, in cases like resource recovery, building moratoria do not serve the goal of improving the environment. I would urge you to pay particular attention to the concerns of public officials in this area.

Finally, elected officials may be particularly sensitive to the connection between mass transit funding and Clean Air Act deadlines. Mass Transit is crucial to the City's plans to continue progress toward meeting the ozone and carbon monoxide standards, as it is to many other cities as well. The Administration has proposed to eliminate the approximately $3 billion annual federal mass transit program funded from general revenues. Similarly, the House Budget Committee is currently looking at mass transit as a target for deficit reduction. This is occurring at the same time that Congress is looking at the sanctions that should be imposed on states and localities for their "failure" to meet air quality mandates largely associated with automobile traffic.

Turning to more specific points raised in your letter, I am in agreement with you concerning State II Vapor Control. New York State's SIP requires that implementation of both Stage I and II. Stage I has been implemented and is being enforced by the City of New York.

At the recent State hearings on Stage II, the City strongly supported expeditious implementation of Stage II and recognized that even if on board controls were imposed as a national strategy, Stage II would remain a necessary and timely strategy. While New York State's schedule for implementing State II has slipped, regulations are now proceeding in the public review process. We expect them to be in place by this summerand we will be working closely with the State after their promulgation to expedite their implementation.

We feel that the issue of canisters is one which requires federal resolution. You should be aware that the New York State Petroleum Industry, which feels negatively impacted by the Stage II controls, has successfully lobbied for the introduction of legislation to support canisters in lieu of Stage II controls.

It is our understanding that NESCAUM is a State organization and localities are not represented. We believe New York State is a represented member.It would therefore be more appropriate for them to be the ones to respond to any questions about their level of involvement in supporting the group's proposals.

With respect to gasoline volatility, the City has not taken a position on what the best REID pressure number should be, but supports a re-evaluation of the issue based on should technical guidance. The current certification value for volatility of gasoline is 9 psi. NESCAUM suggests a lower pressure can be required during the warm months, giving a sizable reduction in hydrocarbon emissions yet maintaining vehicle performance. During the 1970's, New York instituted a local law requiring vapor pressures of between 7 or 8 psi during summer months. Vapor testing on gasoline samples was performed at that time and recorded average pressures of 7 psi with values as low as 5.3 psi were recorded. The City would support this concept if the technical guidance showed it to be practical.

The part of the STAPPA/ALAPCO policy dealing with severe non-attainment areas is certainly the most critical for the City. In principle, we support many of the points in Part III as they relate to technology-based control for stationary sources and to a policy that begins to address interstate transport of pollutants. However, the issue of ozone transport is not adequately addressed in the policy. Whatever source controls would be applied to severe and moderate attainment areas should also apply all those areas contributing to such ozone non-attainment. Only in this manner will the ozone problem be dealt with fairly and effectively. I would certainly question any policy which places stringent requirements on severe non-attainment areas without corresponding provisions dealing with transport, in the face of EPA's own judgment that transport alone may be responsible for exceedances in the New York area.

New York City is somewhat different than other regions in that we have numerous small sources which contribute to our ozone exceedance, rather than several large sources which are more effectively controlled. Thus I believe that some of STAPPA/ALAPCO's recommendations may not sufficiently address our particular situation. This does not suggest to me, however, that STAPPA/ALAPCO's efforts to formulate a nationwide policy are necessarily inconsistent with the needs of this City.

I will provide you with additional, specific comments addressing my perspectives on the STAPPA/ALAPCO policy as soon as those policies are finalized.

Again, thank you for the opportunity to comment on this critical topic.

All the best.

Sincerely,

Edward I. Koch
MAYOR

CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION
2358 MUNICIPAL BUILDING, NEW YORK, N.Y. 10007 (212) 566-8200

HARVEY W. SCHULTZ
Commissioner

March 17, 1987

Henry A. Waxman
Member of Congress
House of Representatives
Committee on Energy and Commerce
Room 2125
Rayburn House Office Building
Washington, D.C. 20515

Dear Congressman Waxman:

We have reviewed your letter of 1/21/87 and have prepared an informational package that begins to answer your very thorough questioning of issues associated with Clean Air Act compliance.

I feel that the information we are providing will be useful to you and the committee, particularly after having the opportunity to discuss some of these issues with you. I feel that the recent session with the NYS delegation was productive and I personally enjoyed meeting with you. I am encouraged by the similarity in our perspective on major areas of concern and in our mutual desire to meet the committments made in state implementation plans necessary to achieve the goals of the Clean Air Act.

As you may known, the EPA and New York State have been sued by Natural Resources Defense Council. They are requesting a formal recall of our SIP, and a public revision process. We are working closely with state and federal representatives to respond to the issues raised in the litigation.

It is important to note that our SIP document considered and incorporated all reasonably available control measures. The City has dedicated considerable resources to the implementation of these control measures. For example, the annual budget for the enforcement portion of our traffic control program is upwards of $31 million. Capital programs designed to improve traffic flow in heavily congested areas of the City carry price tags totaling $140 million in committed funding. These particular efforts have resulted in significant progress toward reaching the NAAQS standard for carbon monoxide. Indeed, a recent letter from EPA Regional Director Christopher Daggett to Mayor Koch acknowledges the efforts of the city's and applauds the City's strong commitment to clean air goals (Attachment 1).

The city has acted in good faith and in a fashion entirely consistent with the Clean Air Act. As stated by EPA administrator Lee Thomas "the Act will have to be amended and the problem of post 1987 non-attainment will inevitably be one of the issues addressed in those amendments." This is because in its present form the Act, and its legislative history, do not clearly address the inability of all reasonably available control measures to bring about attainment in an area by the deadline. On its face the Act appears to force a choice between drastic transportation controls with severe economic consequences or the imposition of sanctions including moratoria on construction or modification of new emitting sources. There is however also support in the statute that the sanctions are not intended to punish states and localities that, despite good faith efforts, cannot bring about attainment.

We are, of course, cognizant of the current projections concerning N.Y.C.'s ability to comply with the Clean Air Act standards for carbon monoxide (CO) and ozone by 12/31/87 and are equally concerned about the public health problems associated with non-compliance. We have begun to plan extra effort programs which we hope will assist in lowering carbon monoxide, reactive hydrocarbons and particulate emissions. In fact, the City has begun to define two distinct work plans, one to address ozone reducing strategies and the other carbon monoxide emissions reduction initiatives.

A recent focus of the ozone control program for NYC is toward alternative fuel research. We are active participants in EPA's NYC methanol bus demonstration program and are working on the implementation of a large scale alternative fuel demonstration program for fleet vehicles. The largest benefits from these program are in hydrocarbon and particulate emission reductions. However, we would also like to study the potential benefit in localized carbon monoxide emissions reductions as part of the alternative fuel work.

Based on some preliminary work that we have prepared on alternative fuels, and attached for your use (Attachment 2), we believe that methanol and compressed natural gas burn cleaner than gasoline and that the automotive technology is being developed to assure that a methanol or CNG engine meets realiability, durability and drivability standards of the gasoline powered vehicle. We would certainly support a program that encouraged the development of alternative fueled vehicles and concurrent regulations to support implementation. We feel it may be premature to call for a program calling for the use of such fuels without having the support network in place. We are dissappointed that the CO emissions permissable under the EPA's proposed rulemaking for methanol engines is no stricter than that for the gasoline engine.

Other areas of work include updating our emissions inventory to determine if further reductions from sources within NYC are practicable and supporting the State in improving and upgrading the inspection and maintenance program.

Our carbon monoxide reduction strategies are linked to our independent goal to implement a regional transportation plan. While we are working with city and state transportation agencies in defining this broader goal, we understand that the solution to the City's localized carbon monoxide exceedances will require limiting vehicle access in those areas. We believe this type of strategy will require economic sanctions in order to be effective. We are committed to the planning and environmental study efforts needed to implement this type of program.

CARBON MONOXIDE

1. Progress In Meeting Goals

Reviewing the historical carbon monoxide monitoring data, we see a trend that is indicative of the benefits that have been gained from the implementation of the State's Inspection and Maintenance program, the City's taxi inspection program and the City's traffic control measures. As shown in Attachment 3 (pp. 11-12, 21), the 6-year history for the Canal Street and 49th Street monitor locations show both a decrease in the annual 2nd highest 8 hour maximum and in the number of days with an exceedance of the 8 hour standard. There is a very noticeable improvement between 1984 and 1985. This trend continues as evidenced by the data available for the period 7/1/85-6/30/86. This data reports the 2nd higher 8 hour maximum for Canal Street as 9.8 ppm with 3 days of exceedances and for 45th Street, as 9.5 ppm and 3 days. Data for the P.S. 321, Brooklyn Transit and Alexander's sites are available for fewer years, but a comparison of the information in Attachment 3 and 3a supports this trend of improving air quality in some of NYC's most heavily trafficked areas, i.e., Canal Street, 59th Street (Alexander's), and 45th Street in Manhattan and downtown Brooklyn (Brooklyn Transit site).

However, New York City's ability to adequately access compliance with the CO standard is severly hampered by an inadequate air monitoring network. We lack actual emissions concentrations for background levels in each of the five boroughs and thereby must estimate these concentrations in our modeling effects. In addition, the limited data collected at ground level leaves us with little information on the effectiveness of our efforts to mitigate the efforts of growth in areas where modeling may be overpredicting concentrations. We believe that the City and State should implement an extensive CO monitoring network as well as argumenting the existing system with additional monitoring capabilities for particulate, nitrogen oxide, heavy metals and volatile organics.

2. Where We Are Now In Achieving Compliance

In reviewing the documents being provided you relating to the SIP for control of carbon monoxide, you will notice that NYC is now left with a number of intersection locations that do not show compliance with the standard. We believe that one of the reasons that these sites do not show compliance is a result of a greater amount of development in localized areas than was anticipated.

The SIP was designed to provide for better traffic management to reduce congestion and increase speeds. These traffic measures have in fact been extremely effective in increasing speeds and thereby increasing capacity. Unfortunately as the traffic moved more freely, more cars were attracted which in turn once again reduced capacity. Ironically our success has proved to be our failure.

Although our modeling efforts project non-compliance at a number of locations in Manhattan's Central Business District, and newly developing business districts in Brooklyn and Queens, the majority of the 5 boroughs of NYC have already been brought into compliance. We are submitting to you our current State Implementation Plan, our Reasonable Further Progress Reports and Group II-IV Reports for carbon monoxide (Attachments 4-10) which describe the CO mitigate measures and the implementation plan, air quality benefit and status for each of these measures. The assumptions used in our air quality modeling are explained in Appendix K (Attachment 11).

We feel that the air quality model needed to evaluate these sites that have a particularly urban topography, characterized by high street walls, is overly conservative and may be predicting concentrations greater than those actually occuring. While this is the best available tool at the present, we are aware of its limitations. We therefore are pursuing a study to calibrate this model using current traffic data, and verify its accuracy by comparison to air monitoring data which would be collected at sites where modeling results are in question.

The City is evaluating an expanded number of strategies that would result in the reduction of vehicles in our most congested area, the Manhattan CBD. These measures are explained in Attachment 12. We believe that with one or more of these strategies, we can achieve compliance with the CO standard. We also recognize that due to some street configurations in Manhattan, an area wide vehicle reduction strategy will not assure total compliance, and that very site specific measures designed for a specific result, such as prohibiting trucks on certain streets, will be necessary to achieve compliance.

OZONE

We recognize that the ozone problem is more difficult to resolve as we are dealing with the cumulative emissions of sources in the larger geographic area of New York, New Jersey and Connecticut.

However we are working with New York State Department of Environmental Conservation to continue efforts to bring the area into compliance. We feel the State's response will more adequately describe the progresss acheived in meeting our SIP committments.

1. Where We Are Now In Achieving Compliance

There are two primary reasons why the ambient air quality standard for ozone has not yet been attained. First, all the strategies called for in the SIP have not yet been implemented. In particular, Stage II Vapor Recovery regulations have not yet been promulgated by the State. In recent state hearings on proposed Stage II regulations, the City strongly urged the adoption of such controls. Until all the strategies are in effect, we will not be able to demonstrate attainment. Second, the implementation of control strategies by upwind communities in large part determines the ambient levels in the City. We are therefore dependent on other jurisdictions to achieve attainment. The enclosed SIP presents the ozone control strategies for the New York Metropolitan region. It is our understanding that the State of New York will be supplying you with a listing of the implementation steps and air quality impacts of each strategy.

2. Emissions Inventory And Stationary Source Permits

The emissions inventory by source and pollutants is contained in the SIP for ozone which is prepared by NYS. We are including a copy of that information, however questions regarding it can best be answered by NYS. Banking and bubbling of emissions are controlled by the State. However, there has been no banking or bubbling in the City of New York.

3. Federal And State Support

We believe further federal support is required in three areas to assist local governments in attaining ozone standards. First, the EPA should decide expeditiously whether on board vapor recovery systems will be required nationally and should determine appropriate gasoline volatility standards. Second, all levels of government should work together to improve ambient air monitoring, which is the backbone of informed decision making. Third, the EPA should increase its basic research regarding ozone formation and transport.

We feel that the most recent rollback in federal fuel economy standards for motor vehicles is in the wrong direction but should not have a substantial effect on our ability to meet air quality standards.

4. Effectiveness Of Other Specific Measures

We are unable to provide a quantitative answer to your request to evaluate the potential air quality gains available through the imposition of nationwide automobile tailpipe standards and correspondingly strict standards for trucks, buses and diesel vehicle or through the use of alternative fuels. We support actions that act to control pollution at its source such as tighter emissions control that results in a reduction in emissions. Without a much more detailed review of the proposed standards, including vehicle performance under various driving conditions we cannot evaluate if these standards would actually result in the benefit desired for all classes of vehicles.

New York City has a great many stationary emission sources. Your letter does not specify a threshold; however, using 50M BTU per hour or more as a definition of a "large" boiler, we estimate there are about 1,000 industrial/commercial and about 1,000 residential boilers in the "large" category. Although we have engineering data for each individual boiler, we do not have data on individual emission rates, potential to burn natural gas, or conversion costs.

We are currently planning a data collection and analysis effort which would provide the City with the information to determine what the potential air quality impacts are to evaluate technological improvements and to determine what the appropriate course of action, ie., stricter control modification or closure, for apartment house and hospital incinerators.

I would point out, however, that New York City has perhaps the strictest standards in the country regarding fossil fuels. Fuel oil sulfur content is limited to .3%. There are very few coal burning facilities left in the City, and the burning of bituminous coal is prohibited.

We are of course available to discuss these issues with you in greater detail, and look forward to a productive dialogue on this critical matter.

Sincerely yours,

Harvey W. Schultz

cc: Deputy Mayor Stanley Brezenoff
Deputy Mayor Robert Esnard
Ross Sandler
Rosemary Ginty
Judy Chesser
Ed Seeley
Jim Brenner

Attachment 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK NEW YORK 10278

2 DEC 1986

Honorable Edward I. Koch
Mayor, City of New York
City Hall
New York, New York 10007

Dear Mayor Koch:

I am pleased to take the opportunity to comment on New York City's proposal to seek public input on its efforts to develop innovative measures for reducing motor vehicle congestion and improving air quality in New York City. The personal leadership role you have assumed in spearheading the City's efforts is critical toward assisting the State in achieving the Clean Air Act deadline of December 31, 1987 for attaining the health-related standards for the automobile derived pollutants, carbon monoxide and ozone.

As you are aware, the Clean Air Act requires that all areas of the country have plans in place to provide for attainment of the national ambient air quality standards for carbon monoxide by December 31, 1987. New York State in its State Implementation Plan has, in fact, made a legal commitment to attain the ambient standards by that date. However, air quality data at various monitoring stations across Manhattan and Brooklyn continue to show violations of the health-related 8-hour carbon monoxide standard on a widespread basis. Studies associated with several major development projects that are proposed for Brooklyn and Manhattan further reveal that, if uncorrected, the City's air quality problems will persist well into the 1990s unless extensive traffic management measures are undertaken on an areawide as well as a localized basis.

This condition persists despite the progress made through implementation of the State's motor vehicle inspection and maintenance program, the City's taxi inspection program, and the City's traffic control measures. However, it has long been known that it would take extraordinary measures to provide healthful air quality in New York City in light of the City's density of development and economic vitality. In addition, long-term declines in transit ridership have eroded past improvements that might have been realized from the federal motor vehicle control program and the transportation control measures implemented by the City. Clearly, more progress needs to be made in obtaining the emission reductions necessary to attain the Clean Air Act goals.

It is apparent that comprehensive transportation management and ambitious transportation strategies to reduce traffic volumes and congestion are essential to the continued economic and environmental well-being of the City. I am hopeful that the type of program that is outlined in the report will go a long way towards providing the City with the kind of traffic flow improvements that are necessary, both to maintain the City's economic vitality and to achieve the health-related ambient air quality standards.

It is also quite clear that the success of the plan will require a clear mandate to those City agencies charged with its implementation. It will be incumbent upon them to build a consensus with the general public and other affected public interests. Because the roots of the congestion problem extend beyond the City's boundaries, it is essential that the Port Authority of New York and New Jersey and the Metropolitan Transportation Authority become full participants in the planning and implementation processes. I also recommend that the New Jersey Department of Transportation and the New Jersey Transit Corporation be invited to work with the New York City Department of Transportation in this effort.

I commend you for your public expression of commitment to this course of action and look forward to working with New York State and the City in facilitating the implementation of the improvements that are necessary to meet the requirements of the Clean Air Act.

Sincerely,

Chris Daggett

Christopher J. Daggett
Regional Administrator

cc: Ross Sandler, Commissioner
New York City Department of
Transportation

Harvey W. Schultz, Commissioner
New York City Department of
Environmental Protection

Herbert Sturz, Chairman
New York City Planning Commission

Henry G. Williams, Commissioner
New York State Department of
Environmental Conservation

Attachment 2

CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF ENVIRONMENTAL MANAGEMENT
2444 MUNICIPAL BUILDING, NEW YORK, N.Y. 10007 (212) 669-8930

HARVEY W. SCHULTZ
Commissioner

MIRA BARER
Deputy Commissioner

M E M O R A N D U M

TO: Stanley Bresenoff
Robert Esnard

FROM: Harvey W. Schultz
Mira Barer

DATE: October 3, 1986

RE: Alternate Fuels Program

The Department of Environmental Protection has completed a crash research effort to explore the major issues involving an alternative fuel program. The results are presented in the attached report. The objective of this work was to be able to either recommend an alternative fuel program or to conclude that necessary information for decision-making was lacking and further study was required.

We have analyzed the available information carefully and have concluded that there is not a clear technical nor economic basis for proceeding with the implementation of a mandated alternative fuel program for fleet without first completing concurrent environmental, economic, and engineering feasibility assessments for compressed natural gas (CNG) and methanol fueled automobiles/light duty vehicles.

This decision is based on the following key factors:

1. Emissions testing data, while promising, is limited to a small data set representative of various nationwide efforts and to a handful of single vehicle tests done by DEP's mobile systems lab. These results do not allow us to determine with statistical confidence the magnitude of emissions benefit to be realized. However a high proportion of the CNG test results show a decrease in carbon monoxide (CO) and hydrocarbon (HC) emissions when compared to gasoline and generally similiar levels of nitrogen oxides (NO_x) although both higher and lower levels have been recorded. Methanol test results for automobiles and light duty vehicles are variable but generally interpreted to be favorable.

2. As a worst case, the alternative fuel program might increase concentrations of other emissions by-products, particularly NO_x and aldehyles, creating other air quality problems while showing minimal reductions in hydrocarbon and carbon monoxide emissions per vehicle, thereby producing no measurable benefit.
   Such a scenario raises questions of economic and regulatory feasibility as well as of a reasonable implementation time frame in which to see the benefits. We believe that emissions reduction benefits will be measurable and that the conversion of certain segments of vehicle population could have a positive affect on localized CO problem areas and on areawide ozone levels. However, we require a more substantial data set consisting of vehicle tests in this local area to justify that conclusion.

3. Durability and efficiency of engine design has not been tested for the majority of NYC driving conditions nor over long term mileage accumulation. Additional information should be collected before a longterm committment is made.

4. The necessary regulatory mechanism is not well, developed for large scale implementation, including safety precautions. The demonstration program will allow the Fire Department and other involved agencies to promulgate any additional regulations that may be deemed necessary.

5. The infastructure system to support an alternative fuel program is not in place. At present, vehicle refueling station are extremely limited, and not freely accessible to the public. This limit on driving range makes immediate large scale implementation impractical. From an economic prospective, it appears premature to invest in an infrastructure system unless a profit can be reasonably assured.

We do feel that there is sufficient evidence to support the concept of an alternative fuel program and recommend that a program of study be funded which could lead to a large scale conversion program in vehicle fleets within the next 5 years. Although the full benefits of such a program would not be realized until after 1987. The program would have a number of positive benefits . The program may provide positive benefits in ozone reduction; the program will help show that the city is doing everything it can to lower CO emissions should post 1987 measures be needed, and ecomonic benefits might be recognized.

The elements of the study program include an emissions test program, vehicle durability and efficiency test programs,economic feasibility study, regulatory implementation study including a health and safety risk assessment.

The program would proceed as follows:

1. First a limited City fleet conversion, followed by a limited taxi fleet conversion.

The City fleet conversion would proceed first with retrofitting of a minimum of 25 cars for CNG use, followed by 25 cars for methanol use. The number of cars could be expanded if monies are made available for purchase, of cars training and construction of fueling stations. The rationale for this phasing is that CNG cars can be converted relatively inexpensively and quickly, existing cars can be used and there is an existing fueling station in the Brooklyn Union Gas (BUG) facility at Greenpoint.

In addition, the Fire Department has specific regulations for CGN fueling stations. These factors would allow us, as shown in the attached Tables, to have these vehicles operating within 6 months of the bid date ie. 12/86-5/87.

A second CNG refueling station is desirable, as well. This could be designed for independent of the CNG conversion program and could be expected to be operational within a year from the bid date.

The conversion of City fleet cars to methanol, requires a longer lead time, because new cars would have to be built by a car manufacturer, a fueling station would have to be built, and Fire Department regulations would have to be reviewed and possibly be modified to allow issuance of permit. As shown in the timetable this would allow delivery by late 1988.

2. The second phase of the program would be the initiation of taxi fleet's to the alternative fuel program by purchasing 100 CNG vehicles and 100 methanol vehicles and the construction of a fueling station for each at the fleet location as well as at an airport. A tentative schedule is laidout in the attached Tables.

The City program would require the expenditure of funds for conversions of a minimum of 25 cars to CNG of existing city vehicles purchase of a minimum of 25 methanol vehicles, installation of two fueling stations at a DEP facility for methanol and CGN and training of mechanics and drivers.

The taxi program would require that alternative fuel both CNG and methanol vehicles be incorporated into the taxi fleet. As the issuance of test medallions is not supported by TLC an alternative incentive program might include, purchasing the vehicles for the fleet and under a lease agreement have the fleet use their existing medallion; provide fuel stations and or provide for training of mechanics and drivers. Such negotiations need to begin immediately as we anticipate many months of effort will be neccessary to reach an acceptable agreement .

The total costs for all phases of the program, would be approximately 3 to 3.5 million dollars. Funding for the various aspects of the program might include NYS ERTA, monies from the Stripper Wells Suit and the utilities or fuel supplier's themselves. We would like to reach agreement with the suppliers of gas and methanol for them to pay for the installation of fueling stations.

Based on these scheduling projections, we feel it is possible to implement an alternative fuel testing program beginning with 25 CNG vehicles within a realistic timeframe and work to refine methodologies to address recommendations contained in our part through the establishment of a TAC as described in the attached report.

We would like to meet with you to discuss implementation of a pilot program at your earliest convenience.

TABLE 1

LOW BID TIMEFRAME

a) Develop Bid Specifications	- 3 weeks
b) Submit Bid Package to DEP Legal	- 2 weeks
c) To Corporation Council	- 1 week
d) 3 days lead City Record	- 1 week
e) City Record (publish for 10 weekdays)	- 2 weeks
f) Bid Opening Date 15 week days from start of Advertising in City Record	
g) Review of Bids	- 2 weeks
Total	- 14 weeks

TABLE 2

NEW YORK CITY FLEET
CNG Conversion Schedule

Activity	Start Date	End Date	Cost
Vehicle Conversion			
1) low bid contract for 25 vehicles with training for mechanics and drivers. [a]	11/86 (see table 2 for low Bid time-frame)	5/87 registered contract)	
2) convert 25 DEP vehicles	5/87	7/87 (25 vehicles 3-5/ week)	$90,000
Fueling			
1) Request CNG fuel allocation from DGS [b]	11/86	inplace by 5/86	no net cost, use existing fuel allocation for gasoline.
2) low bid contract for CNG refueling station on DEP property [c]	1/87 begin designing specifications using public utility as supplier [d]	open	$125,000 We hope to have supplier pay for facility.
Pre-Implementation Tasks			
1) Identify DEP fleet vehicles for conversion	12/86	3/87	DEP Staff
2) Identify maintenance locations	12/86	3/87	DEP Staff
3) Design emissions test program including quality assurance/quality control procedures (QA/QC)	12/86	3/87	DEP Staff
4) Design maintenance and durability data collection program with DGS, including QA/QC.	12/86	3/87	DEP/DGS Staff
5) Identify additional maintenance requirements, parts cost, testing costs and determine if sufficient funds are available.	12/86	3/87	DEP/DGS Staff Unknown.

6) Train mechanics and drivers.	6/87	7/87	Included in conversion contract.
Operational Tasks			
1) Introduce vehicles into workforce.	6/87	7/87	________
2) Maintenance	on-going	on-going	No additional staff requirement.
3) Testing	on-going	on-going	No additinal staff requirement.
4) Fueling	on-going	on-going	Longer time frame than usual. [e]

NOTES

a) This number reflects a minimum sized fleet for the emissions testing program, assuming a taxi fleet is to be introduced within the following year. A large number of this type of vehicle is not necessary for emissions testing since these vehicles do not accumulate milage as rapidly as a taxi and 25 cars would give us an adequate number of samples, based on testing every 3 months, regardless of mileage accumulation. The advantage of a taxi fleet is that mileage is accumulated more quickly than for a passenger car. Therefore test concerning engine maintenance, durability, efficiency, which are dependent or mileage can be run for a shorter timeframe.

A large City, vehicle fleet could be converted to CNG for demonstration purposes. The size of the fleet would become dependent on funding. Conversion costs are estimated at $1800 to $2000 per vehicle and incurred cost would include additional training for mechanics and drivers, one or more adequately sized and appropriately located refueling facility(s).

b) DGS is in the process of contracting with Brooklyn Union Gas (BUG) to buy CNG motor vehicle fuel and at BUG's CNG refueling facility in Greenpoint.

c) A second refueling location is desirable to improve driving range of vehicles. However the investment for installation, estimated at $125,000 for a 100 car facility might be difficult to justify within additional information on CNG cars.

d) The economics of refueling facility may improve if designed to use reclamined methane sewage treatment plants and landfills, a natural by-product ie. freskills methane recovery operations.

e) Staff time must be added to include getting to and from the Greenpoint location for refueling.

TABLE 3

NEW YORK CITY TAXI FLEET
Methanol Vehicle Acquisition Schedule

Activity	Start Date	End Date	Cost
Vehicle Acquisition			
1) Low Bid Contract for 100 - 125 new vehicles witn methanol engines, including training. [a]	12/86	6/87	$1 million.
2) Delivery Data for vehicles.		9/88 [b]	
Fueling [c]			
1) Low Bid Contract for installation of fueling facility on city property. Two others to be constructed on taxi fleet property and at the airport.	4/87	1/88 (registered contract)	estimate $100,000 per facility. We hope to have the fuel supplier pay for facilities.
2) Low Bid Contract for fuel supplier	6/87	1/88 (registered contract)	$ [d]
Pre-Implementation Tasks			
1) review test program from CNG program and modify if needed.	6/87	9/87	DEP/DGS Staff
2) identify additional maintenance requirements, parts cost, testing costs and determine if sufficient funds are available.	3/87	6/87	———
3) Train mechanics and drivers.		9/88	include in vehicle contract
4) Construct refueling stations.	3/88	9/88	

Operational Tasks		
1) Introduce 25 methanol vehicles into City work force.	9/88	
2) Introduce as experimental taxi fleet (see separate Taxi Schedule Table 4).		
3) Maintenance modify if needed.	on-going	
4) Testing	on-going	
5) Fueling	on-going	

NOTES

a) Purchase vehicles for both city and taxi fleets under same Bid. However, it may be possible to receive a small number of vehicles as a partial shipment, earlier than suggested and the remainder at a later date.

Fire Department regulations would also be updated. Each of these factors would require ading more time to our time line if we were the first methanol station application. The time needed to purchase vehicles is balanced by the additional time needed in the permitting process.

b) Date is a projection; availability subject to manufacturers ability to produce engine.

c) Although the methanol vehicle implementation date is farther away, there are a number of issues that are being addressed by the work in progress on EPA's methanol bus demonstration program in NYC. Problems associated with the delivery, transport, storage and dispensing of methanol fuel are to be resolved, allowing for the construction of a methanol refueling facilty for the EPA program.

d) Cost would be depend on economics at that time.

TABLE 4

Taxi Fleet Schedule

Activity	Time Frame	Cost
Vehicle Acquisition		
1) City Purchases 100 new cars for conversion to CNG	3-6 months to delivery	$10,000 per vehicle [a] total $1 million.
2) City contracts for conversion to CNG as a new contract defined in Tabel 1	3-6 months to complete work expected delivery date 9/88	$1,800 - $2,000 per vehicle. Total $180,000 - 200,000
3) Methanol car purchase outlined in Table 2.		
Fueling		
1) Site to be provided by fleet operator	(see table 1 and table 2)	[b] $250,000
2) Construct facilities for CNG at Depot and Airport methanol - See Table 3.		
Provide training for fleet mechanics and drivers		contract item, in aquisition contract.
Pre-Implementation		
1) In addition to Table 1 and Table 2 requirements design QAQC for implementation with taxi fleet.		
Operation		
1) Turn vehicles over to taxi fleet via lease or other arrangement.		

NOTES

a) Sources of funds for this program should be identified. Two possibilities are NYS ERTA and as a portion of the settlement for Stripper Wells Suit.

b) These costs will depend on the agreement between the City and the fleet operators.

Testimony of
Don Theiler, Director
Bureau of Air Management
Wisconsin Department of Natural Resources
before the
Environment and Public Works Subcommittee
on Environmental Protection

March 26, 1987

Mr. Chairman and Members of the Subcommittee, my name is Don Theiler and I am the Director of the Air Management Bureau in the Wisconsin Department of Natural Resources. I am appearing today on behalf of the Wisconsin Department of Natural Resources.

I appreciate the opportunity you have provided to present the Department's views on the complex issues surrounding attempts by both EPA and the states to attain the ozone and carbon monoxide standard. You have already heard from speakers who have described the serious health impacts of ozone and have characterized the magnitude of this problem nationwide. You have also heard the recommendations of the State and Territorial Air Pollution Program Administrators (STAPPA) and the Association of Local Air Pollution Control Officials (ALAPCO). I will not repeat any of this in my testimony. The Wisconsin Department of Natural Resources is in general agreement with the recommendations of STAPPA and ALAPCO.

However, Wisconsin would like to see some of these recommendations strengthened to deal with issues I will touch upon in my testimony.

The purpose of my testimony is:

1. To describe the progress which Wisconsin has made in controlling ozone and carbon monoxide pollution. Wisconsin has made very significant progress and has attained the standard in all areas of the state except Milwaukee.

2. To explain the impact of the Chicago-Gary Metropolitan area emissions on the remaining ozone problem in Milwaukee. . The problem in Milwaukee can only be corrected by aggressive control actions in the Chicago-Gary Metropolitan area.

3. To highlight the need for adjustments to the Clean Air Act which will ensure that the ozone air quality standards are met and will be maintained in areas subject to interstate transport, without unfairly penalizing states like Wisconsin which have moved forward aggressively.

Wisconsin's Progress

First, let me describe the situation in which Wisconsin found itself in the 1970's. At that time, violations of the ozone standard were a regular occurrence in a large part of the state.

We had monitors which recorded exceedances in most of the southeast half of the state. Madison, Green Bay and Milwaukee and some relatively rural areas were defined as nonattainment by the U.S. EPA. In the late 70's we began implementing our ozone control program as required by U.S. EPA and by 1982 we had reached attainment in every area of the state except in the Milwaukee Metropolitan area. Our ozone control program involved statewide Reasonably Available Control Technology (RACT) for most major stationary sources and RACT on most minor stationary sources in the southeast third of the state which included Madison, Green Bay and Milwaukee. It is important to note that in order to ensure attainment outside the Milwaukee Metropolitan area, Wisconsin felt that we had to impose RACT on stationary sources over and above the traditional basic requirements of EPA. This approach has been very successful. Since 1982 we have not had any violations of the ozone standard outside of the Milwaukee area. We are convinced that this would not have been possible without the statewide RACT requirements and the RACT requirements on most minor sources in the 18 county southeastern third of the state.

In the Milwaukee Metropolitan area, we have regularly experienced very severe ozone problems. In the 1970's it was not unusual to record ozone levels which were twice the current ambient air quality standard of .12 parts per million. These levels were recorded along the Lake Michigan shoreline from north of Milwaukee down to the Wisconsin-Illinois border in Kenosha.

Because of the very severe nature of this problem it became evident that we would not be able to meet the standard by 1982 therefore, we requested an extension until 1987.

To obtain the extension, we agreed to implement an inspection and maintenance program as well as full implementation of RACT 3 and 4. Our plan for this area was developed and implemented in a timely and orderly fashion. Attached to this presentation is a summary of our Reasonable Further Progress Report which documents our success in getting the reductions which we had planned. In fact, we have gone beyond the required reductions for ozone through a combination of factors including, extending control requirements to smaller sources, requiring offsets from minor as well as major sources, tightening the I/M program beyond minimum requirements, requiring reductions in the adjoining rural areas, and by incorporating a 10% growth factor into the SIP planning to allow for growth at existing sources.

These actions plus over-compliance by some sources, technology improvements, and shutdowns will take us about 15% to 20% beyond the level projected necessary to meet the ambient air quality standards for ozone. The results of these reductions are obvious. By 1983, the situation was improving, especially north of Milwaukee as can be seen from Table 1. At present, the region, especially the area north of Milwaukee, is very near attainment.

Table 1

Milwaukee Metropolitan Area
Second Highest O_3 Concentrations

Year	South of Milwaukee Racine, Wisconsin	North of Milwaukee Grafton, Wisconsin
1983	.217 ppm	.179 ppm
1984	.175 ppm	.128 ppm
1985	.137 ppm	.130 ppm
1986	.146 ppm	.126 ppm

Carbon Monoxide was another pollutant for which we had to request an extension of the attainment deadline until 1987 for the Milwaukee area. We have now come into full attainment with the carbon monoxide standard. The implementation of the Inspection/Maintenance Program in early 1984 was the key to attainment . That program, in combination with the continued implementation of the Federal Motor Vehicle Emission Control Program has resulted in February 15, 1984 being the date of our last carbon monoxide exceedance.

In summary, the State of Wisconsin has very aggressively pursued attainment programs for both ozone and carbon monoxide. We have often gone beyond the normal minimum requirements to ensure attainment. We have:

1. Statewide RACT for most major stationary sources.

2. RACT for most major and minor stationary sources in the southeast third of the state, regardless of attainment status,

3. Required offsets in the Milwaukee Metropolitan area for minor as well as major sources,

4. Tightened the requirements for our vehicle inspection/maintenance program beyond those mandated by U.S. EPA, and

5. Exceeded the required reduction targets by 15 to 20% in the Milwaukee Metropolitan area.

These extraordinary efforts have resulted in attainment and maintenance of the carbon monoxide standard in Milwaukee, and of the ozone standard in all of the state with the exception of six counties located in the Milwaukee area. This effort demonstrates that it is possible tomeet the standard in many areas of the nation in a timely manner. Wisconsin is the only state in Region V which has a fully approved Ozone State Implementation Plan. The results of implementing this plan are very apparent.

The Chicago-Gary Interstate Transport Problem

The question remains, why isn't the Milwaukee area meeting the ozone standard as a result of this major effort? The answer is contained in two words "interstate transport". The emissions coming northward from the Chicago-Gary Metropolitan area overwhelm our control efforts and continue to cause exceedances of the ozone standard. Our analysis shows that additional reduction in Wisconsin would not substantially affect this situation. Milwaukee lies about 90 miles directly north of Chicago and every day on which we have experienced an ozone exceedance during the past three years the winds have been from the south, southwest, or southeast for all or a portion of the hours from midnight to noon.

During the morning hours, large amounts of the main ozone precursors (volatile organic compounds, VOCs) are generated in the Chicago and Gary Metropolitan areas and due to the lake effect are pulled out over Lake Michigan. This is a localized effect where the lake is generally warmer than the land surface and this temperature differential tends to pull the VOC compounds out over the lake and upward. The general southerly winds I referred to in the previousparagraph push this pollution laden air mass northward. As the day progresses the land mass warms more quickly than the water and a reverse localized movement of air begins. The polluted air mass is now pulled onshore.

Ozone has been forming in this relatively undisturbed air mass and there is often a very clear trend evident as it moves up the west shore of Lake Michigan. Additional localized inputs of pollutants also contribute to the problem but the major impact of the Chicago-Gary air parcel is clearly evident. This can be seen from the following four illustrations. Figure 1 shows where the various communities are that are referred to the discussion. Figure 2 is a generalized scheme showing the movement of the air along the western shore of Lake Michigan during the summer when we have clear hot days and southerly winds. Figures 3 and 4 show the clear impact with time and distance of the polluted air from the Chicago-Gary area as it moves northward during the day. One axis of this illustration shows the time of day while a second shows the location of ozone monitors along Lake Michigan from south to north, while the vertical axis shows the ozone levels recorded at that station. If there is a black circle above a column that means that the ozone standard was exceeded at that station during that hour.

As an example from Figure 3, the first violations of the ozone standard on August 28, 1984 occurred between 2:00 - 3:00 p.m. at stations in Kenosha and Racine. Until that time the polluted air mass was out over Lake Michigan and the land had not heated sufficiently to pull the polluted air onshore. Between 3:00 and 4:00 p.m. the violations began to occur at our Milwaukee site at the University of Wisconsin Milwaukee North (UWMN). This is approximately 25 miles north of Racine. Not until about 7:00 p.m. did our monitor in Sheboygan begin to register the violations caused by this northward moving air mass. Sheboygan is about 50 miles north of the site in Milwaukee. By that time the values further south in Racine and Kenosha had returned nearly to background levels. A close examination of Figure 4 shows the same general trend.

This information shows that the Chicago-Gary Metropolitan area emissions are the cause of the ozone air quality violations in Wisconsin. If these emissions were sufficiently reduced, there should no longer be violations of the ambient air quality standard for ozone. Also, additional unilateral reductions in the State of Wisconsin will do little if anything to correct the nonattainment situation on the western shore of Lake Michigan.

In spite of this, Wisconsin is actively pursuing legislation which will require sources in the Milwaukee Metropolitan area to further reduce their emissions.

The primary purpose of this legislation will be to ensure that Wisconsin has instituted all reasonably available measures and will be able to eliminate the need to require offsets from all industrial sources wishing to locate in southeastern Wisconsin.

The additional measures being contemplated at this time are:

1. A strong anti-tampering program to compliment the existing inspection/maintenance program,
2. Stage 2 vapor recovery at all service stations,
3. Stringent controls on oil-based architectural coatings,
4. Establishment of limits on auto body refinishing and clean up solvents and;
5. Limiting the VOC content in highway traffic paints.

This legislation will further enhance our existing accommodative state implementation plan - a plan which can accommodate future growth for well controlled new VOC sources without requiring individual offsets.

In addition, these reductions will ensure that Wisconsin has instituted most of the requirements contained in the recommendations of STAPPA/ALAPCO for the moderately severe nonattainment areas. We expect that these additional actions will result in approximately 4,000 tons of additional reduction in VOCs, which is an additional 7% reduction from the anticipated level of emissions for 1987. We intend to do our part to meet the ambient air quality standard for ozone and allow for the future growth of new sources of VOCs.

At the same time we are highly frustrated by the lack of progress in Illinois and Indiana. They have moved very reluctantly to implement even the minimum measures already in place in Wisconsin. Neither of these states has an approved State Implementation Plan and the likelihood of the required reductions being in place by the end of this year is virtually nill. Inexplicably, no sanctions are proposed at this time by U.S. EPA. In light of this situation, the Attorney General of the State of Wisconsin will, within the next two weeks, file a complaint in Federal District Court to force U.S. EPA to intercede and promulgate adequate plans for these two states. This is an unfortunate situation, but at this time we feel that we have no alternative. The health of our citizens is being adversely affected and our industry is being unfairly penalized for doing what the law requires. The problem can only be corrected by aggressive control actions in the Chicago-Gary Metropolitan area.

Recommended Changes to the Clean Air Act

The recommendations of STAPPA/ALAPCO for changes in the Clean Air Act are sufficient to deal with most situations but in our opinion they do not go far enough to adequately recognize and protect states such as Wisconsin from non-performance by its neighbors. We would recommend:

1. Stronger automatic non-discretionary sanctions and penalties to be imposed on states which fail to meet the reduction targets established by law.

2. Any additional requirements for reductions from 1987 levels of emissions must be based on a reduction from the required target level of emissions contained in the state implementation plan for 1987 or the actual 1987 level of emissions whichever is less. It should not be based only on actual 1987 emissions. The actual 1987 emissions will in many cases include emissions which should have been controlled prior to that date. This recommendation will prevent states which have not performed from being rewarded for their past non-performance.

3. The study of transport phenomena be expanded to focus on the unique conditions found in the problem areas such as the southern end of Lake Michigan. The traditional simple ozone (OZIPP/EKMA) models should be replaced with more sophisticated photochemically reactive models which also provide a better

analysis of the role of oxides of nitrogen. However, such studies must in no way slow the implementation of available control measures.

4. States should not be able to substitute one set of measures for another (e.g., tampering inspections for inspection/ maintenance). Both sets of measures are available at reasonable cost and should be required.

5. Once the ozone standard has been attained, strong measures should be built into a revised Clean Air Act to ensure that the standard is maintained. If a clear enforceable accommodative state plan is not developed and approved by EPA, offsets should continue to be required in all areas affecting the newly redesignated attainment areas. U.S. EPA and the states must look beyond just attainment of the standards to ensure continued maintenance or we will be appearing before you again in ten years on this same subject.

6. A strong toxics program should be developed as a part of the Clean Air Act. Because of the serious health implications resulting from the unregulated emissions of toxic compounds the emissions of a potentially toxic compound should be minimized by strict control requirements unless a clear demonstration can be made that it does not pose a health threat. A strong new

toxics program will further reduce VOC emissions and help ensure attainment and maintenance of the ozone standard across the entire nation.

7. The law should be tightened to require 100,000 mile warranty coverage on motor vehicle emission control systems and stronger efforts should be made to ensure warranty replacement of these systems by auto manufacturers. If auto manufacturers can offer 100,000 mile warranty on outer body rust through, they can offer such coverage on catalytic converters. The Clean Air Act defines the useful life for emission control components to be 10 years/100,000 miles.

8. Stronger measures should be instituted to ensure that the present regulations are being adequately implemented and enforced in all of the states. This must include providing adequate resources for both state and federal agencies to do the job along with strengthened federal oversight on state and local implementation and enforcement. Finally, the creation of a congressionally appointed oversight commission is needed to ensure that EPA does its job. It is our impression that in some areas substantial additional progress can be made by implementing and enforcing the present law. Failure to do so up to this point rests jointly with the states and U.S. EPA.

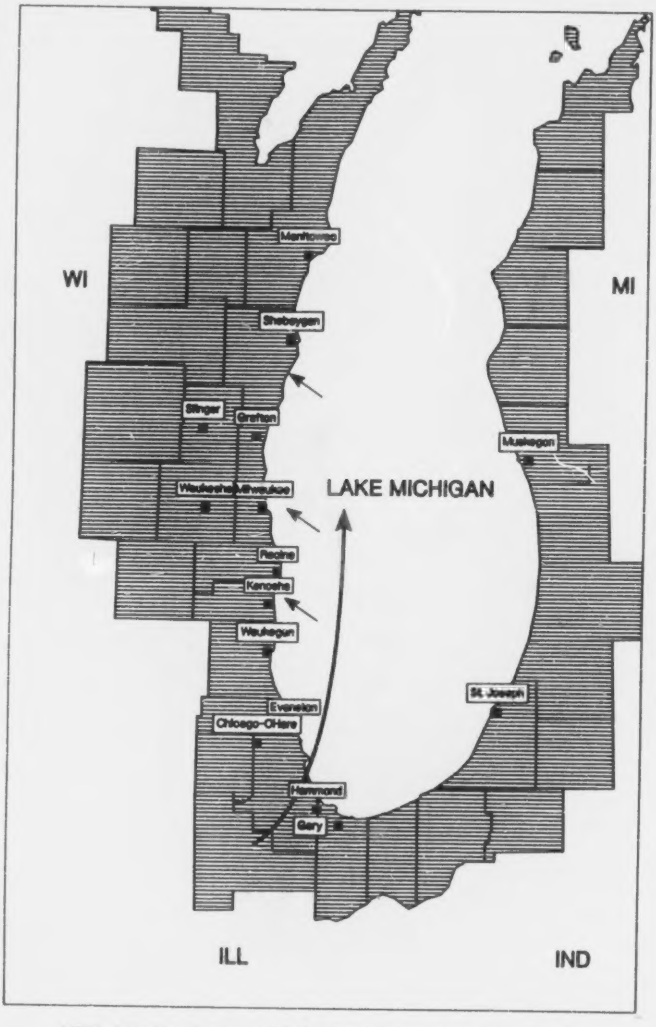
In summary, Wisconsin has met and exceeded the ozone state implementation plan requirements, and we are moving to institute further reductions. At the same, time our sister states to the south, Illinois and Indiana do not even have approved plans, much less the implementation and enforcement resulting from such plans. An illustration of this failure to implement and enforce regulations is amply demonstrated from the fact that in December 1986 the Wisconsin Department of Natural Resources was pursuing enforcement actions against 29 significant violators of VOC regulations in the Milwaukee Metropolitan area. In contrast only 14 similar actions are underway in Illinois and only four in Indiana. If you have no regulations you will have no violators. This lack of planning, implementation and enforcement is responsible for the continued exceedances of the ozone standard along the western shore of Lake Michigan. The excessive emissions from the Chicago-Gary Metropolitan area has resulted in our being forced into taking legal action against U.S. EPA to protect the health of our citizens and the integrity of our air quality control program. Changes in the Clean Air Act are also urgently needed to help correct this problem and to ensure once and for all that it does not re-occur.

Thank you for considering our concerns on this important matter.

Figure 1

LAKESHORE OZONE IN SE WISCONSIN

The Role of Transport in Ambient Standard Exceedances

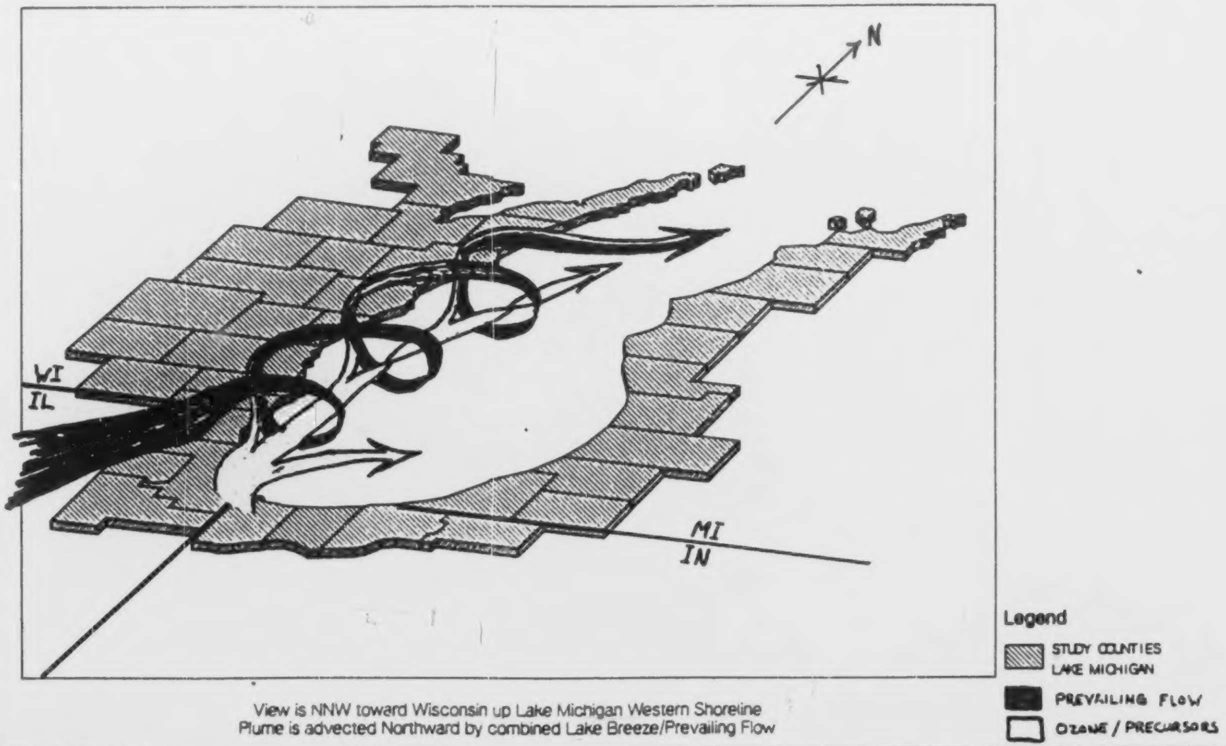


A Daily Analysis of Concentration Trends, Wind Direction and Lake Breeze
1984 - 1986

Figure 2

PRECURSOR AND OZONE MOVEMENT NORTHWARD IN LAKE BREEZE CELL - PATTERN A

A Midafternoon Onshore Breeze within a WSW to SSW Prevailing Flow

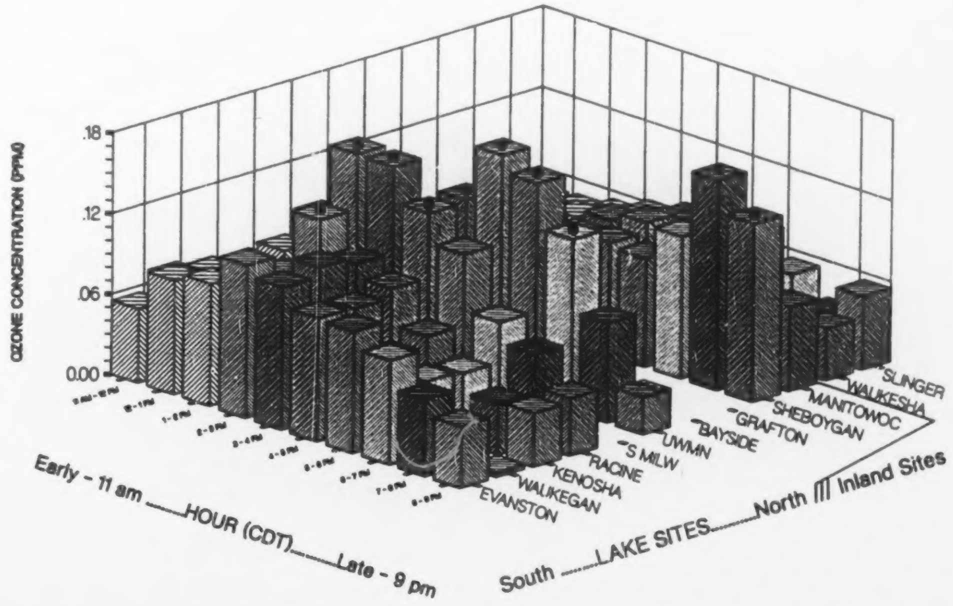


View is NNW toward Wisconsin up Lake Michigan Western Shoreline
Plume is advected Northward by combined Lake Breeze/Prevailing Flow

Figure 3

OZONE CONCENTRATIONS - AUGUST 28, 1984

BY HOUR AND BY SITE - SOUTH TO NORTH

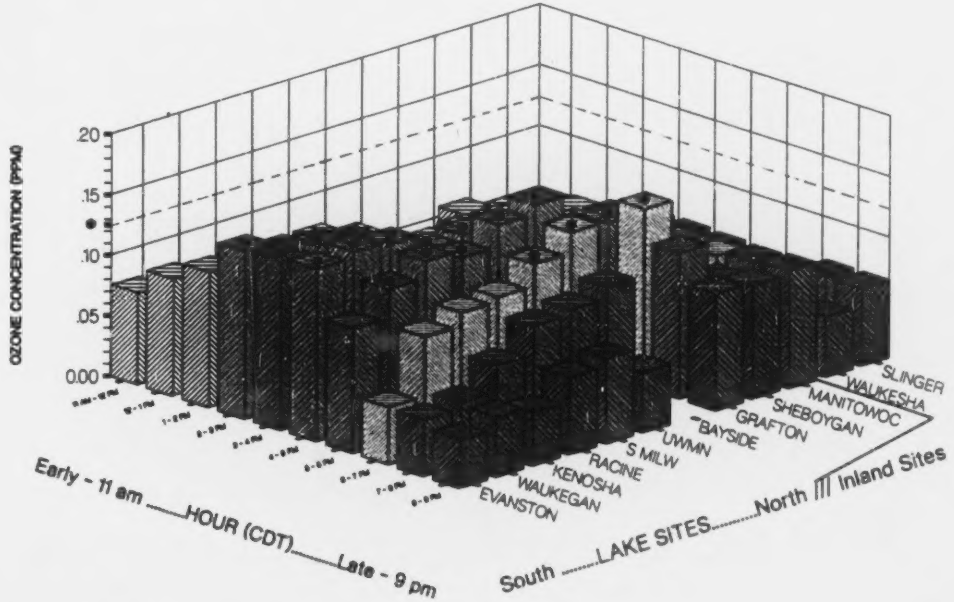


Waukesha and Slinger are Inland sites adjacent to UWM-N and Grafton
● = Exceedance of Ozone Standard - .125 ppm or greater

Figure 4

OZONE CONCENTRATIONS - JUNE 8, 1985

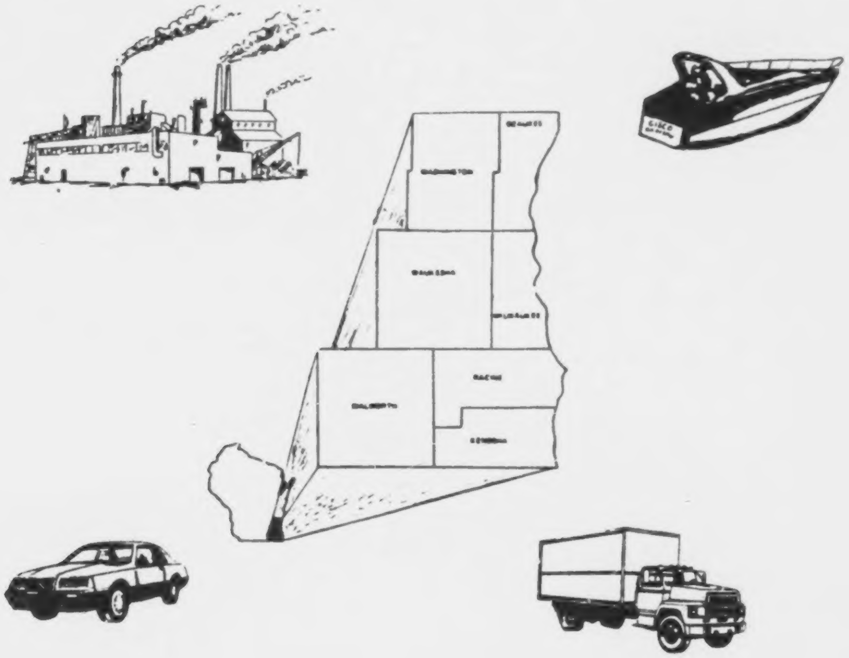
BY HOUR AND BY SITE - SOUTH TO NORTH



Waukesha and Slinger are Inland sites adjacent to UWM-N and Grafton
● = Exceedance of Ozone Standard - .125 ppm or greater

Reasonable Further Progress Report For 1985

Revision of the 1982
Wisconsin Ozone/Carbon Monoxide
State Implementation Plan



Wisconsin Department of Natural Resources
Bureau of Air Management

Executive Summary

Introduction

In 1982, in accordance with the Clean Air Act, the U.S. Environmental Protection Agency required Wisconsin, along with other affected states, to develop a plan for reducing ozone and carbon monoxide (CO) levels in areas where the ozone air quality standard was being repeatedly exceeded. In 1983, the Wisconsin Department of Natural Resources submitted its State Implementation Plan (SIP) to reduce ozone and CO levels. This plan was approved in 1984. The SIP applies to a 7 county area in southeastern Wisconsin (see Figure A).

VOC Reduction

The primary means of lowering ozone levels is control of volatile organic compound (VOC) emissions - the main precursor to ozone formation. The SIP contains a plan for gradually reducing these VOC emissions from different types of emission sources. This 1985 Reasonable Further Progress Report (RFP) is a description of how well Wisconsin is doing in reducing VOC emissions and ambient ozone levels.

As can be seen in Figure B, 1985 VOC emission levels were 4251 tons below the SIP predicted level. In contrast, 1984 reported VOC emissions were 2,899 below the SIP predicted level. Compared to the ultimate 1987 VOC emissions goal required to meet standards, 1985 VOC emissions are only 3,455 tons above this goal.

This substantial reduction of VOC emissions below the 1985 predicted level can be attributed primarily to higher than expected decreases in emissions from large stationary sources of VOC's. These sources control their VOC emissions by process changes or with air pollution control equipment available at a reasonable cost. This level of control is known as (RACT) Reasonably Available Control Technology. As shown in Figure C, the RACT emissions are 24% below the predicted level. This reduction appears to be due to a combination of factors, including changing process techniques, plant shutdowns, RACT overcompliance, business slowdowns, and product changes.

Figure A

Analysis Area
1982 Ozone State Implementation Plan
for Southeastern Wisconsin

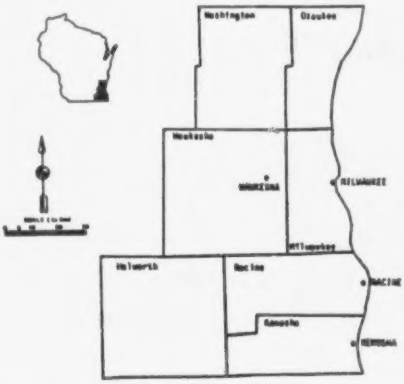
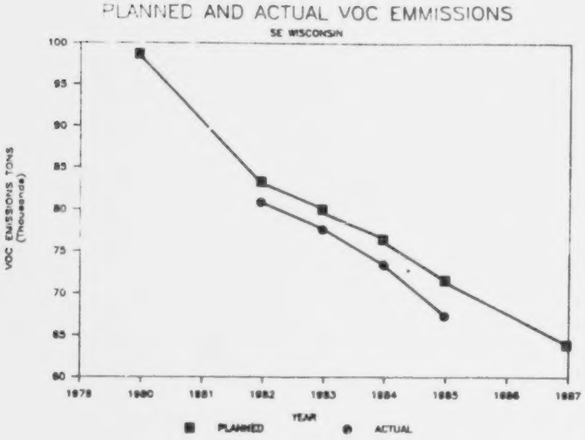


Figure B



On the other hand, the non-RACT stationary sources in 1985 were above their predicted level of VOC emissions by 7% (see Figure C). This increase is relatively minor in proportion to the decrease which occurred with the RACT VOC emission sources. Those industrial activities responsible for this increase in non-RACT emissions include blanket roller wash (associated with printing), incineration, plastics coating, petroleum based dry cleaning and miscellaneous processes.

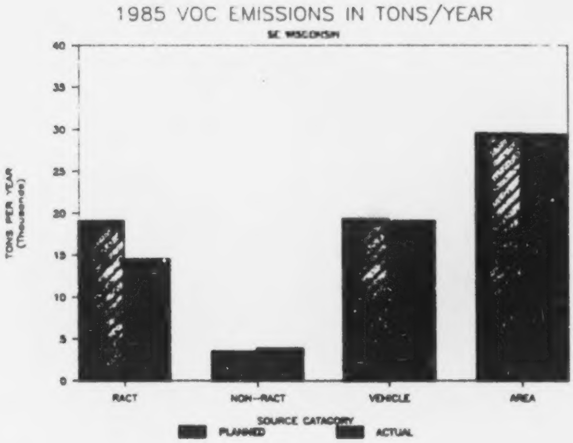
VOC emissions from cars and trucks in 1985 were slightly less than the amount predicted in the SIP.

Area source emissions are at about the level predicted in the SIP.

Ambient Ozone Levels

From 1983 to 1985, the number of days on which the ozone standard was exceeded at any monitoring station in southeast Wisconsin decreased from 18 to 6. The maximum concentration measured in the region decreased from .244 ppm in 1983 to .165 ppm in 1985. Despite the decrease in the number of times the ozone standard was exceeded, the decrease in the maximum ozone concentration, and the decrease in VOC emissions, problems with high ozone levels continue. This may be attributed to the meteorological conditions which cause ozone and ozone precursors to be transported into Wisconsin from the Chicago-Gary area to the south. It will be difficult to attain the ozone standard by reduction of VOC emissions in Wisconsin alone when excessive ozone and ozone precursors are being transported into the southeastern Wisconsin nonattainment area from the south.

Figure C



Carbon Monoxide

A plan for reducing carbon monoxide emissions and lowering ambient concentrations to levels below the standard was included in the 1983 State Implementation Plan. A description of reasonable further progress in meeting objectives of that plan is also contained in this report.

There were no exceedances of the carbon monoxide standard at the WDNR monitoring sites in 1985. Overall, in the past three years (1983-85), ambient CO levels have generally decreased in the Milwaukee nonattainment area. Consistent with this ambient CO trend, significant reductions in CO emissions have occurred throughout Milwaukee County, including the CO nonattainment area. Continued attainment of the CO standard in Milwaukee County is expected in future years. Credit for attainment of the CO standard is given to the Federal Motor Vehicle Emission Control Program and the State Inspection and Maintenance Program for vehicles.

STEVE COWPER
GOVERNOR

STATE OF ALASKA
OFFICE OF THE GOVERNOR
JUNEAU

April 6, 1987

Senator George Mitchell,
Chairman
Senate Environment Subcommittee
SR-176 Russell Senate Office Bldg.
Washington, D.C. 20510

Dear Senator Mitchell:

I am writing in connection with your current hearings to present the State of Alaska's views on the issue of state and local involvement in the effort to attain air quality standards. In Alaska, the State and local governments of Anchorage and Fairbanks have been working to attain air quality standards for carbon monoxide (CO).

Since 1977, Alaska has provided information to Congress, the Environmental Protection Agency (EPA) and other states regarding the problems in attaining these standards in cold climates because of temperature inversions and higher cold temperature emissions from vehicles. Earlier this year, the Fairbanks North Star Borough wrote to the House Subcommittee on Health and the Environment regarding these difficulties. These remarks apply equally to the status of the situation in Anchorage, the other Alaska city with nonattainment problems. Therefore, I have attached a copy of the Fairbanks presentation for your review and ask that it be included in the record of this hearing. Below, I summarize some of our major concerns.

Vehicle Inspection and Maintenance (I/M) programs alone are unlikely to result in either city attaining the air quality standard for (CO), despite the fact that both Anchorage and Fairbanks have implemented strong I/M programs. Higher emission at cold temperatures limit the effectiveness of such programs.

EPA estimates emissions at 45° F to be 50% higher than at 75°; however, EPA administratively has set emissions certification at a temperature range of 68° of 86° F. While EPA has considered certifying at lower temperatures, the agency has not revised its procedures. EPA has no effort underway to examine this problem. The attached letters identify a number of possible approaches to the problem.*

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*The letters referred to have been retained in committee files.

The State is currently evaluating these and other alternatives and looks forward to working with this committee to address the current situation.

Sincerely,

John W. Katz for
Steve Cowper,
Governor

cc: Senator Stevens
Senator Murkowski
Representative Don Young

TEXAS AIR CONTROL BOARD

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March 27, 1987

The Honorable George J. Mitchell, Chairman
Subcommittee on Environmental Protection
Senate Committee on Environment and
  Public Works
SR-176 Russell Senate Office Building
Washington, D.C. 20510

Dear Senator Mitchell:

This is in response to your recent request that our agency testify at the March 26, 1987 hearing of the Senate Environment and Public Works Subcommittee on Environmental Protection. Although we were unable to attend the hearing, we appreciate the opportunity to comment with regard to nonattainment of the National Ambient Air Quality Standard for Ozone and hope that you will find the written statement and documentation enclosed with this letter to be useful in your deliberations.

These written comments do not include specific recommendations for statutory amendments, but rather focus on describing the general concerns that we believe must be addressed if a sound ozone control policy is to be developed. Also, we understand that the State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Control Officials will present to your subcommittee certain proposals and we believe there are several positive aspects to their recommendations.

Based on the persistent inability of major parts of the country to even approach attainment of the ozone standard, we believe that basic changes in approach are in order. Specifically, we believe that studies should be conducted to expand our technical base of information to better direct future control programs toward implementation of truly effective measures. Correspondingly, we believe that statutory deadlines and sanctions should be disassociated with monitored ambient levels of ozone but should continue to be used to assure progress toward attainment of the standard through implementation of reasonably effective control programs.

Our agency realizes that there are only limited resources available for air pollution control and that the effective use of these resources will ultimately determine the success of our efforts to improve our air quality. We have found ozone control efforts to be extremely costly, both in terms of industrial economic expenditures and in terms of regulatory agency manpower, and yet non-productive in terms of reduced ozone levels. The inability to significantly reduce ozone levels concerns us, but so does the continued use of our limited resources to prepare and implement ozone strategies which restricts our ability to thoroughly address other air pollution problems. We do not advocate abandonment of all efforts to reduce ozone levels in our urban areas. However, we see the need for additional work on the causes and effects of high ozone levels. We believe the results of this work could form the basis of a cost-effective ozone control strategy. In the meantime, regulatory agencies should have the opportunity to redirect some of the resources available for air pollution control programs to other potentially more productive efforts. For example, we believe that additional work in the area of toxic air contaminants and visibility impairment could produce significant health and welfare benefits for our citizens. Shifting resources from responding to non-productive requirements for additional ozone planning will, thus, remain a high priority for our agency.

If you have any questions about this information or would like additional information, please let me know.

Sincerely,

Eli Bell

Allen Eli Bell
Executive Director

Enclosures

cc: Texas Air Control Board Members

TESTIMONY OF

ELI BELL
EXECUTIVE DIRECTOR
TEXAS AIR CONTROL BOARD

BEFORE THE

SENATE ENVIRONMENT AND PUBLIC WORKS SUBCOMMITTEE
ON ENVIRONMENTAL PROTECTION

MARCH 26, 1987

Chairman Mitchell and members of the Subcommittee. My name is Eli Bell and I currently serve as Executive Director of the Texas Air Control Board. I appreciate this opportunity to address your Subcommittee and to briefly discuss our perspective on one of the air quality issues before us today -- nonattainment of the National Ambient Air Quality Standard for Ozone.

Ozone nonattainment cannot be viewed as a new environmental concern. Control programs were first established in the early 1970's to reduce atmospheric formation of ozone through reducing emissions of one ozone precursor, volatile organic compounds (VOC). Deadlines for attainment of the ozone standard were set but measures taken to attain the standards by these deadlines failed to produce the anticipated results and congressional action to provide additional time was required. More stringent and far-reaching control programs were enacted and more sophisticated planning techniques were employed, but once again predictions did not correspond to reality. Today Congress is being asked again to provide relief from the upcoming attainment deadlines. Along with this action, Congress will be asked for guidance as to how future control programs should proceed. We believe that basic changes in approach are needed and that the experiences of the past fifteen years must be carefully considered and accounted for if we are to formulate an ozone control strategy that will be more effective in the future than it has been in the past. Let us then look more closely at these experiences and at alternative strategy approaches.

Our experience with ozone control efforts can be viewed as a mixture of success and failure. Extensive efforts have been made to control emissions of ozone precursors, especially VOC, and our data indicate that these efforts have been successful in reducing these emissions. The attached materials describe the control efforts and results for several ozone nonattainment areas in Texas. Numerous controls have been required on existing high VOC emitting industrial processes, state-of-the-art technology has been applied on new facilities, new cars have been designed to meet increasingly more stringent emission standards, and in-use motor vehicles have been monitored and repaired to maintain control effectiveness. Each of these measures has been implemented as an economically reasonable control but cumulatively these controls have cost millions, if not billions, of dollars and thus must be viewed as representing a substantial national control effort.

Success in reducing ambient ozone levels has not always followed, however. (Documentation of air quality trends in Texas is attached for your reference.) Reasons for continued high ozone levels may vary from area to area but are likely based on numerous compounding factors. An examination of these factors would seem to be in order if we are to design an effective control strategy for the future. Factors to be considered should include: (1) the apparent difficulty of controlling or even affecting the atmospheric reaction or rate of reaction involved in forming ozone; (2) the difficulty in estimating the true emissions and emissions growth for an area; (3) the effect of transport of ozone or its precursors from one area to another; (4) the difficulty of assuring full effectiveness of controls; and (5) the inability to control precursor emissions sufficiently without utilizing socially disruptive control measures. Taken together, these factors outline an extremely complex environmental problem, the solution to which may be equally complex.

The current strategy for attaining the ozone standard takes a relatively simplistic approach to solving this problem. The strategy assumes VOC precursor emission reductions will result in reductions of monitored ozone and that this cause and effect relationship can be quantified and the quantification used to predict necessary levels of control. If we are unable to accurately quantify this relationship or if VOC emissions cannot be controlled sufficiently to reduce ozone levels below the standard under all atmospheric conditions, this strategy approach will be destined to continued failure to produce the desired result. Alternate approaches to future ozone control strategies may thus be appropriate. We are currently examining these alternatives and we believe that significant changes are in order. Studies must be conducted to evaluate the true effectiveness that can reasonably be expected from implementation of additional VOC controls. Implementation of extremely costly or socially disruptive VOC control measures without such support cannot be justified. Furthermore, deadlines and sanctions must be uncoupled from attainment based on monitored ozone levels. The uncertainties inherent in control of this pollutant cannot be overcome by the establishment of arbitrary deadlines. Deadlines can be utilized however to assure progress through requirements for scheduled implementation of studies and reasonable controls. In this light, we would like to offer the following points for consideration.

Control Strategy

As previously described, many questions as to how to design the most effective control program remain unanswered. How can we improve our technical knowledge, understanding and methodologies so as to be able to design more effective control programs? How can we better understand the controlling factors in the formation of ozone and the most effective methods for positively impacting ozone formation? Funding and resources to accomplish on specified schedules technical studies designed to expand our scientific understanding should be provided. Study areas could include effectiveness of alternate control programs, such as nitrogen oxide controls; impacts of ozone and ozone precursor transport; and relationships among precursor emissions, ambient precursor levels and resultant ozone concentrations. Results of these studies could be used to design and implement future control programs.

Considering the need for additional technical studies to better direct the focus of future control programs, what would be a prudent control approach for today? One approach would be to continue to utilize the current VOC based control strategy to implement technically and economically reasonable controls. To the extent that additional VOC controls can be implemented reasonably, the environmental benefits from such controls can be realized. In this manner, areas with marginal exceedances and for which VOC controls can be effective in reducing ozone levels may attain the ozone standard. Areas with more pervasive problems or for which VOC precursor levels are not the controlling factor in ozone exceedances will have reduced levels of potentially harmful ambient contaminants, but will have restricted expenditures so as to preserve limited resources for future control programs which may be more likely to effectively address the ozone problem for that area.

How should long-range problems be addressed? If continued implementation of reasonable measures to reduce precursor emissions does not result in ozone attainment within the next five or even ten years, should socially disruptive measures be undertaken? Are such measures as gas rationing and industrial relocation appropriate and, if so, for what level of problem -- areas with two hours per year above the standard, twenty hours, two hundred hours? Should local citizens be provided options prior to implementing such programs?

Deadlines and Sanctions

The primary impetus for this ozone debate probably has been the approach of the statutory deadline for attainment and the possibility that widespread sanctions could be implemented for failure to attain the standard by that deadline. Moving the deadline forward again would be one approach to consider here but alternative approaches are also available.

What is the most effective approach for using deadlines to assure progress toward achieving nationwide attainment of the ozone standard? We believe that deadlines for phases of implementation of additional controls would assure continued progress more effectively than deadlines for monitored attainment considering the uncertainties surrounding attainment strategies. Deadlines based on monitored attainment have of necessity led to a cumbersome and inaccurate planning process by which strategies are designed and implemented. Valuable and limited regulatory resources are thus expended in planning efforts accepted as having inherent inaccuracies in terms of predicting attainment which may be of a magnitude greater than the emission reductions to be achieved.

Since sanctions carry punitive weight, these would seem to be most effectively applied to counteract economic advantages that might accrue to an area failing to adopt control programs being required in other areas with similar problems. Where control programs have been implemented but have failed to produce the desired results, it is difficult to imagine how imposition of economic sanctions can either force the necessary technology or change the science to constructively address the cause of the problem.

We are looking carefully at each of these and the other issues that comprise the review of our nation's ozone control policy. We have also reviewed policy options and recommendations expressed by other groups and have found many common concerns. The need to review and develop controls best tailored for an area based on the extent of the problem and the dominant influences continues to be a key ingredient in many proposals. The need for relief from unattainable deadlines and non-productive sanctions is a central focus for many of the statutory recommendations under consideration. The need to address questions about the effectiveness of existing and proposed strategies and the appropriate approach to long-range as well as short-term planning are also issues for which congressional guidance is sought.

We do not have the answers necessary to recommend a technically sound program that will result in nationwide attainment of the standard within the next year, five years or even ten years. Our experience would indicate that the complexities of ozone control surpass our scientific understanding of its causes. Instead, we share your frustration over the inability of our state and federal regulatory efforts to reduce ozone levels. We further add to that frustration our personal concerns that vast resources have been dedicated to ozone control to the detriment of other and equally pressing environmental challenges. We believe that more effective alternative approaches to attainment of the ozone standard can and should be developed and look forward to continuing to work with you toward that end.

ATTACHMENTS

Document 1: "Dallas County VOC Emission Reductions"

Document 2: "Tarrant County VOC Emission Reductions"

Document 3: "Summary of SIP Controls and Associated Emission Reductions by County" (2-page table)

Document 4: "Air Quality in Texas, 1974-1983"

Document 5: "Texas Air Quality, 1980-1985"

Document 6: "Report on Reasonable Further Progress in Reduction of VOC Emissions, Harris County" (1985)

Document 7: "Report on Reasonable Further Progress in Reduction of VOC Emissions, Dallas/Tarrant Counties" (1985)

Document 8: "Report on Reasonable Further Progress in Reduction of VOC Emissions, El Paso County" (1985)

Document 9: "Report on Reasonable Further Progress in Reduction of Carbon Monoxide Emissions, El Paso County" (1985)

Document 10: "NO_x Emissions, Tons Per Day" (1-page table for Harris, Dallas, Tarrant, and El Paso counties)

Document 11: "TACB Regulation V: Control of Air Pollution from Volatile Organic Compounds" (7-26-85)

Please contact Mr. Jim Gise, Acting Director, Control Strategy Division (512/451-5711, ext. 220) for copies of these documents.

Statement of
The Associated General Contractors of America
Presented to the
Subcommittee on Environmental Protection
of the Committee on Environment & Public Works
United States Senate
on the Topic of
Proposed Revisions of the Clean Air Act

AGC is:

- More than 32,000 firms including 8,000 of America's leading general contracting firms responsible for the employment of 3,400,000-plus employees;
- 106 chapters nationwide;
- More than 80% of America's contract construction of commercial buildings; highways, industrial and municipal-utilities facilities;
- Over $100 billion of construction volume annually.

The Associated General Contractors of America represents more than 32,000 firms, including 8,000 of America's leading general contracting companies which are responsible for the employment of more than 3,400,000 individuals. These member contractors perform more than 80 percent of America's contract construction of commercial buildings, highways, industrial and municipal-utilities facilities.

AGC is pleased to submit this statement for the record, in conjunction with current hearings on revision of the Clean Air Act of 1970.

The 1970 Act was a recognition of the need to address the clean air issue. Its laudable intent, however, was largely frustrated by overly stringent and unrealistic requirements which were further complicated by complex regulations. AGC, as is true of all responsible organizations, supports the objectives of the Clean Air Act, but believes that the lessons learned from its implementation to date should be realistically and fairly applied to achieve the proper objectives of the Act.

The Clean Air Act of 1970 set national ambient air quality standards and established deadlines for states to meet those standards. States were required to submit, for EPA approval, plans to achieve the standards. While the population and commercial activity has increased since 1970, there has been a demonstrated improvement in air quality. Some areas, however, have not yet attained the standards for hydrocarbons.

Revisions to the Act have extended the deadline to attain air quality standards to December 31, 1987. According to current EPA statistics, over seventy-six Consolidated Standard Metropolitan Areas, (CSMA) are not now in compliance for ozone standards and over eighty-one are not in attainment for carbon monoxide. These areas are located in forty-three states.

The Act further provides the imposition of sanctions on non-attainment areas, even on those areas which are making good faith efforts to meet air quality standards. These sanctions include a ban on construction, and withholding federal grants for air quality programs, highway construction funds and grants for construction of wastewater treatment facilities. This provision has been interpreted to mean that the imposition of the ban on construction is mandatory and that the withholding of grant funds for air quality programs, highway construction funds and funds for construction of wastewater treatment facilities is at the discretion of the EPA Administrator. These funds may be withheld even though areas are making good faith efforts to attain the standards and are proceeding pursuant to EPA approved state implementation plans.

The main issue of contention remains the sanctions provision. AGC opposes the imposition of construction moratoria, and the withholding of federal highway and wastewater construction grants funds to force state compliance with the Clean Air Act. The denial of assistance under one program to force compliance with a requirement in an unrelated area makes no sense because:

- a ban on construction precludes the erection of cleaner facilities;
- a restriction on highway construction prevents the needed building of congestion-relieving highways which in and of itself will increase the air quality by avoiding congestion;
- withholding wastewater facilities construction funds stifles the goal of achieving clean water.

The paradox of this arrangement is that such bans would actually make it harder to bring a nonattaining area into compliance. They would prohibit construction of new plants that are often five or six times more efficient and cleaner than the old ones they replace. They would also cut off sewage treatment construction grants in the very places where pollution from sewage effluents is a problem, and would stop the air quality grants that states use mainly to fund their air pollution control programs. The ripple effects would include the loss of tens of thousands of jobs.

AGC urges that, during the current hearings on revision of the Clean Air Act, the sanctions provision be eliminated and that EPA be provided with the needed flexibility to address the economic and political issues in non-attainment areas by allowing extended deadlines.

Testimony of

ALEXANDRA ALLEN, STAFF ATTORNEY

LESLIE GAINER, STAFF RESEARCHER

UNITED STATES PUBLIC INTEREST RESEARCH GROUP

on Non-attainment of
Air Quality Standards

before the

SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION
of the
ENVIRONMENT AND PUBLIC WORKS COMMITTEE

UNITED STATES SENATE

Washington, D.C.

March 26, 1987

The United States Public Interest Research Group (U.S. PIRG) appreciates the opportunity to submit written testimony on legislation concerning non-attainment of air quality standards. U.S. PIRG is the national lobbying office for state PIRGs across the country. PIRGs are non-profit, non-partisan consumer and environmental advocacy groups.

1. Brief Overview of the Non-attainment Problem

The presence of ozone and carbon monoxide in dangerous concentrations in the air we breathe is damaging public health and deteriorating our country's agricultural output. The resulting health costs and crop losses are substantial.

When Congress passed the Clean Air Act of 1970, it directed the Environmental Protection Agency (EPA) to identify dangerous air pollutants and to establish stringent national ambient air quality standards (NAAQS) designed to ensure the protection of public health. Under the Act, state governments were directed to develop state implementaion plans (SIPs) containing strategies to meet and maintain the NAAQS.

Seventeen years after the national goal of healthful air was originally set, we are faced with a situation in which; 1.) At present, an estimated 73 areas, affecting 80 million people, dc not meet the minimum EPA requirements; 2.) Greater levels of ozone have been authorized in spite of increasing evidence of the substantial health risks posed; 3.) Despite being granted 17 years to comply with the minimum standards, at least 35 areas are unlikely to meet the deadline of December 31, 1987.

The history of the non-attainment problem indicates that much of the continued non-compliance represents a lack of initiative on the part of the private sector and certain government officials, rather than a lack of affordable attainment strategies.

Firm deadlines for the achievement of air pollution standards provide a means to hold government officials and the private sector accountable. Further extensions of the existing deadline must not be provided unless non-attainment areas adopt additional pollution control measures to hasten the attainment of the health standards.

2.) Implementation Delays

The congressionally mandated Clean Air standards have been repeatedly eroded. The current administrator of the EPA has openly admitted that both the EPA and the states "are responsible for many of the SIP inadequacies that contribute to the current problem." /1.

Since the Act has been in effect, three regulatory rollbacks have relieved states from compliance with the NAAQS. Compulsory compliance was initially set for mid-1977. Congressional amendments extended the deadline to 12/31/82, allowing a further extension to 12/31/87 for cities with severe ozone and carbon monoxide problems. /2.

In 1971, the EPA set the maximum permissible ozone level at .08 parts per million (ppm). In 1979 the EPA weakened the standard to .12 ppm. The EPA now acknowledges that the current standard and levels slightly above contribute toward the creation of siginificant health risks. /3.

Another flawed EPA policy allows industrial plants to avoid the Act's requirements for new sources if the net emissions of the plant in which a new source is located do not increase by amounts the EPA deems significant. EPA's own data show that under this weakened standard, more than 90% of the new projects in non-attainment areas can evade the requirements of the Clean Air Act. Twice before, in 1982 and 1984, the Environment and Public Works Committee has voted to overturn this EPA policy. In view of the large number of non-attainment areas, it is essential that Congress make the new source standards applicable to all major new construction as originally intended in the Clean Air Act.

The EPA has also failed to fulfill its responsibility to adequately control auto refueling emissions, a significant contributor to unhealthful ozone levels. Section 202(a)(6) of the Act requires the EPA to study auto refueling emission control systems and to promulgate regulations requiring their use "if feasible and desireable." The EPA has yet to act decisively in this area.

The automobile industry has consistently resisted the use of on-board auto emission control systems, despite an estimated effective rate of 98%. /4.

3. Impacts on Health and Agriculture

Ozone poses a much more dangerous public health threat, and causes more severe damage to crops and forests, than was originally known in 1979 when the EPA relaxed the ozone standard from .08 ppm to .12 ppm. Recent studies indicate that there are serious adverse health effects at the currently permissible .12 ppm level.

Exposure to ozone can obstruct breathing, cause inflammation and burning sensations in the eyes, nose and throat, induce chest pain and generate feelings of nausea. /5.

In recent testimony the EPA highlighted the findings of scientific studies indicating that up to 20% of adults and children who participate in periodic intense exercise for one to three hours at ozone levels at or slightly above the national standard of .12 ppm, will experience a significant decline in normal lung functions.

The adverse effects of ozone exposure can linger for several days. /6. Further, while human studies are not yet conclusive, animal studies indicate that prolonged exposure to ozone results in permanent damage to the lungs. /7. Additional research has established that ozone levels at or below the national standard cause deterioration of immune systems, lessening the ability to resist infections.

Crops and other vegetation are also seriously threatened by existing ozone levels. Recent studies show that ozone levels as low as .05 ppm (far below the .12 ppm standard) are capable of generating significant crop damage. /8.

Levels of ozone as low as .05 and .06 ppm are have been found to be responsible for the following losses: tomatoes 33%, beans 26%, soybeans 20%, corn 9%. Retardation of tree growth under these conditions can range from 12 - 67%. /9.

In economic terms alone, the potential crop losses due to ozone pollution are estimated at $2-3 billion per year. /10.

4. Conditions for Further Extensions

States should be required to comply with specific attainment measures as a condition for further extensions. Once granted, extensions should be of limited duration and strictly enforced. Areas that receive these limited extensions should be compelled to adopt a package of statutorily prescribed ozone attainment measures.

Several measures of controlling the contribution of mobile sources to ozone and carbon monoxide nonattainment are readily available, and in some cases already in use. In addition to more stringent controls on tailpipe emissions of NOx and CO, refueling controls, including on-board and at-the-pump vapor recovery systems, are important steps for non-attainment areas. Automobile inspection and maintenance programs should also be upgraded to ensure that emissions requirements are being met. Reduced motor vehicle use, brought about by the increased availability of mass transportation, and regional development planning that minimizes private transportation, will also be essential to the long-term success of attainment strategies.

To bring most communities into attainment for ozone and carbon monoxide, more stringent emissions standards are needed for stationary sources of NOx, CO and organics. Standards should also be made applicable to all major stationary sources by revising the exisiting plant-wide source definition. Like mobile source emissions, stationary source emissions must receive better monitoring in order to improve compliance with SIPs.

Conclusion

When Congress passed the Clean Air Act it announced its intention to guarantee that air pollution would not be permitted to endanger the public health. Strategies exist to fulfill Congress' mandate. After 17 years, it is time to guarantee that our nation's air quality standards will be quickly and fully implemented.

References

(1) Testimony of Lee M. Thomas, Administrator of the United States Environmental Protection Agency (EPA) given before the House Subcommittee on Health and the Environment, February 19, 1987.

(2) Congress and the Nation, 1977, p. 535 at 538.

(3) EPA Fact Sheet titled "The Health and Welfare Effects of Ozone," submitted to the House Subcommittee on Health and the Environment, February 1987.

(4) Rochelle L. Stanfield, "The Ozone Deadline", National Journal, September 13, 1986, p. 2170 at 2173.

(5) Statement of Homer A. Boushey, M.D., on behalf of the American Lung Association, submitted to the House Subcommittee on Health and the Environment, February 13, 1987.

(6) Homer A. Boushey, M.D.

(7) "The Ozone Deadline", quoting Bruce C. Jordan, Chief of the EPA's ambient standards branch in the Office of Air Quality Planning and Standards at Research Triangle Park, N.C., at p. 2171.

(8) "The Ozone Deadline", quoting Bruce C. Jordan, at p. 2171.

(9) "The Ozone Deadline", at p. 2171.

(10) EPA Fact Sheet.

OZONE AND CARBON MONOXIDE STANDARDS: NONATTAINMENT ISSUES

Health Problems in Nonattainment Areas

TUESDAY, MARCH 31, 1987

U.S. Senate,
Committee on Environment and Public Works,
Subcommittee on Environmental Protection,
Washington, DC.

The subcommittee met at 9:30 a.m. in room SD-406, Dirksen Senate Office Building, Hon. George J. Mitchell (chairman of the subcommittee) presiding.

Present: Senators Mitchell, Baucus, Lautenberg, Graham, Chafee, and Stafford.

OPENING STATEMENT OF HON. GEORGE J. MITCHELL, U.S. SENATOR FROM THE STATE OF MAINE

Senator Mitchell. Good morning, ladies and gentlemen. Sixteen years ago the Environmental Protection Agency set the current standards for ozone and carbon monoxide. These standards are required under the Clean Air Act to be protective of human health "with an adequate margin of safety."

By the end of this year, the EPA predicts that many urban areas will not be able to meet these standards. As a result, over 80 million Americans are living in areas where the ambient air levels of ozone and carbon monoxide exceed these health-based standards.

The purpose of today's hearing is to explore the extent to which we face a health problem in nonattainment areas. Our witnesses are experts in the field of health effects from exposure to ozone and carbon monoxide, and their testimony should provide this committee valuable insight into the problem.

Last week, we heard testimony from witnesses who represent nonattainment areas. These areas may be subject to sanctions such as a ban on construction of major new sources of air pollution and a ban on Federal highway funds. To their credit, these witnesses did not seek a simple extension of the nonattainment deadline.

A major reason for their stated opposition to such an extension was health. Regarding ozone, the State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials said:

> There is strong scientific evidence that exposure to ozone at concentrations at or above the existing health-based Federal standards adversely effects public health. Moreover, no sector appears to be totally immune.

Quoting the EPA, the statement continued,

> The agency also found that children exposed to ozone conditions "not unlike conditions in major urban areas during summer" experienced decrements to lung function which persisted for many days after the ozone episode passed. If the exposure is repeated over long periods of time, permanent lung damage may result.

In addition, carbon monoxide is not a benign pollutant. EPA has concluded that exposure to low levels of carbon monoxide affects aerobic capacity, visual perception, manual dexterity and learning ability and may also harm fetuses. EPA has stated that,

> Those most sensitive to this effect are the estimated nine million people with cardiovascular disease, particularly those with angina or peripheral vascular disease.

Not all of the witnesses today will agree with this assessment of the health risks of air pollution. We want to get all points of view expressed here today. It is important to note, however, that at least some representatives of nonattainment areas last week asked that Congress keep their feet to the fire to assure that the public health is adequately protected.

We hope that today's hearing will shed additional light on what is adequate protection. We are pleased to have the distinguished panel with us.

We will begin with Dr. William McConnell, who is with the EPA Clinical Research Branch.

We have put all of the witnesses in one panel. Ordinarily, we have a 5-minute rule in the committee. That is, your written statements will be placed in full in the record. We ask you to limit your oral remarks to a 5-minute summary of the highlights of your written statement.

Dr. McDonnell is going to give a somewhat more general background of the issue before giving his specific testimony, so we won't subject you to the 5-minute rule, Dr. McDonnell. We will give you a little special privilege, and after you have completed your remarks, we will go to the others and ask them to keep to the 5 minutes; then each person will have a chance to talk further during the question-and-answer period.

Thank you very much, Dr. McDonnell. Why don't you begin? We look forward to hearing from you.

STATEMENT OF WILLIAM McDONNELL, M.D., MEDICAL OFFICER, HEALTH EFFECTS RESEARCH LABORATORY, ENVIRONMENTAL PROTECTION AGENCY

Dr. McDONNELL. Thank you, Mr. Chairman, members of the Subcommittee. Dr. Horstman and I are pleased to appear before you to speak on the health effects of ozone exposure. In particular, I am going to describe some of the effects of ozone exposure; I am going to talk about the conditions under which they occur; and I am going to talk about other populations of individuals who may potentially experience larger changes due to ozone exposure than health members of the population.

When ozone is inhaled in sufficient quantities for one to two hours, it results in death and damage to cells like in the airways and aleoli of the lungs. The body responds to this damage in several ways.

Exposed individuals develop the symptoms cough, shortness of breath and pain upon deep inspiration. They also experience both an inability to take a deep breath and they experience narrowing of the airways. These are acute effects that resolve within one to 24 hours following ozone exposure. There are important health effects, however, in and of themselves to the extent that they produce discomfort and that they can cause limitation of performance.

Concurrent with these acute effects that are very visible, a number of events are occurring that are not so visible. Scavenger cells enter the lung from the blood to remove the dead and damaged cells, a process known as inflammation. This happens over the course of 2 to 3 days during which a repair process occurs replacing these dead and damaged cells with new cells.

If this process of ozone exposure and damage and repair occurs infrequently, it is probably completely reversible with no long-term effects. An analogy to this might be the case of sunburn. When the skin is exposed to too much ultraviolet light, cells are damaged. There is an immediate response with pain and redness. Following this, the pain and redness disappears. There is a several day period during which the damaged cells are replaced with new cells, and you see the peeling process.

We are very concerned, however, that repetitive cycles of this damage and repair accompanied by inflammation may result in more rapid aging of the lung and perhaps will result in the development of chronic lung disease which may result in disability, even during periods of no exposure. This concern is heightened by the results of animal studies which demonstrate chronic changes in lung structure and function following long-term exposure of animals to ozone at concentrations greater than 0.2 part per million.

Let's return to the sunburn analogy. If a person is exposed to the sun and experience a sunburn, generally, there is complete repair of the skin. For people exposed over the years, however, there is accelerated aging of the skin and loss of elasticity of the skin. We are concerned this might occur following repeated exposure to ozone.

We have not been able to detect these long-term effects of ozone on man. However, in short duration, experimental exposures of volunteers to different concentrations of ozone, we have measured the magnitude of the acute reversible effects which I will summarize.

The magnitudes of these effects are functions of ozone concentration and the amount of air breathed per minute, which is a function of the amount of exercise that an individual is performing. Therefore, people that are doing more exercise will inhale more ozone and have larger effects. The magnitude is also a function of the duration of exposure. This a topic that Dr. Horstman will address in the next testimony.

In the study of normal, healthy subjects exposed in our laboratory performing heavy exercise for 1 hour of a 2-hour exposure to 0.12 part per million of ozone, the present national ambient air quality standard, we have observed small average increases in the symptom cough and small average decreases in the ability to inhale deeply.

These changes were larger following exposure of individuals to higher concentration of ozone. We have also observed that individuals are very different in their responses to ozone. Some people are much more responsive than others in terms of these acute effects.

For example, following exposure to 0.12 part per million ozone, some individuals have literally no change in lung function. This is the ability to inhale deeply, or in the symptoms produced, while others may have a 15- to a 20-percent decrement in the ability to inhale deeply and may have induction of moderate cough.

At higher concentrations, even larger differences exist in normal, healthy individuals, with some individuals having no change in lung function following a 0.24 part per million exposure and others having experienced a 45 percent decrement in their ability to take a deep breath. This may result in temporary disability and continue during heavy exercise and is accompanied by moderate to severe symptoms.

These differences in response are very reproduceable. The individuals that have a large response on one exposure when re-exposed up to a year later also have large responses, and people with the small responses also have small responses on reexposure.

We have not yet identified the characteristics which predict who among the population will have these larger effects. There has historically been concern that other well-defined population groups such as women or children, persons with respiratory disease, may be more responsive to ozone than are the healthy white men that are often studied in these experiments.

There have been a number of studies actually looking at these special groups, and we have no evidence at present that any of these other groups is much more responsive to ozone than is the group that I reported on. Rather, within all groups, there is a range of responses with some individuals being more responsive than others, and with heavily exercising individuals much more likely to experience these effects than resting or lightly exercising individuals.

As I mentioned, these observed acute effects must be considered on two levels, as health effects in and of themselves because of the discomfort and the limited performance which may accompany these effects, and also because these effects may indicate underlying cellular events that are occurring which could lead to chronic lung disease with exposure over a number of years.

Much remains unknown, particularly about the long-term effects of ozone exposure. I would draw the following conclusions from what is known:

Small mean changes in lung function and symptoms occur in heavily exercising, healthy individuals exposed to 0.12 part per million ozone for 2 hours. Differences in the responsiveness of individuals do exist, with some individuals experiencing modest symptoms and lung function changes when exposed under the above conditions.

The determinants or predicters of these differences in effect are not known. There are no known other population groups that are more sensitive or responsive to ozone exposure than are healthy, heavily exercising young men. Finally, the long-term consequences of recurrent, short duration exposures or prolonged exposures are not known in man.

However, based upon data from animal studies and what is known about the mechanisms of the acute response in humans, there is concern that such exposures have a potential to cause irreversible changes in lung structure or function.

Thank you, Mr. Chairman.

Senator MITCHELL. Thank you very much, Dr. McDonnell.

We will now go to Dr. Horstman.

You and the others, unlike Dr. McDonnell, will be subject to the 5-minute rule, so please, give us a summary in about 5 minutes.

STATEMENT OF DONALD HORSTMAN, PH.D., CHIEF, PHYSIOLOGY SECTION, HEALTH EFFECTS RESEARCH LABORATORY, ENVIRONMENTAL PROTECTION AGENCY

Dr. HORSTMAN. Thank you, Senator Mitchell. As Dr. McDonnell has discussed, we have previously observed lung function decrements and cough following two hour exposures to 0.12 part per million ozone with heavy exercise.

There is a question whether sufficient numbers of individuals actually perform heavy exercise under these ambient exposure conditions to warrant concern. We hypothesized that if we extended the exposure duration at 0.12 part per million, we would observe lung function decrements and symptoms with the performance of moderate intensity exercise.

To test this hypothesis, 10 nonsmoking males were exposed once to clean air and once to 0.12 part per million ozone for 6.75 hours.

We attempted to simulate the daily energy requirement and activity pattern of typical adults engaged in moderate to severe manual labor or that of children or adolescents engaged in very active play. The morning of exposure consisted of three 50-minute exercises, the first and second followed by 10 minutes' rest, while a 45-minute lunch break followed the third.

The afternoon of exposure consisted of three 50-minute exercises, each followed by a 10-minute rest. A total of 5 hours of exercise was performed, and the level of efforts was about 35 percent of maximal work capacity. This level of effort is within the range normally associated with hard physical work or play.

No responses resulted from the clean air exposure. With ozone exposures, lung function decrements and respiratory symptoms were similar to those we previously observed for other subjects exposed to much higher ozone concentrations. Similar to our previous observations, only about half of the subjects were remarkably responsive to ozone. Of the 10 subjects, five exhibited lung function decrements greater than ten percent, including one in excess of 40 percent.

Of the 10, 6 exhibited spontaneous coughing while 5 rated pain upon deep inspiration as moderate or severe. Under ambient exposure conditions similar to those employed in our study, the more ozone responsive individuals may be unable to continue their normal activities due to the severity of these ozone-induced responses.

I might add that the results from studies of children attending summer camp and exposed for prolonged daily periods to low level ambient ozone suggested ozone-induced responses similar to those we observed.

We also measured nonspecific airway reactivity. Previous studies, primarily from Dr. Boushey's laboratory, have demonstrated that increased airway reactivity also occurred only in some fraction of the individuals exposed to ozone.

It is highly relevant that those individuals who demonstrated ozone induced increases in airway reactivity also experienced airway inflammation. In our study, the average airway reactivity with ozone was more than doubled and for four subjects was at least four times greater than that with clean air. These results are meaningful to the extent that increased reactivity may be indicative of ozone induced airway inflammation and, as suggested by Dr. McDonnell, the extent to which airway inflammation may be involved in permanent airway damage.

I would caution you when considering our findings. Exposures were to 0.12 part per million ozone, and protection against the effects from more prolonged exposures will certainly be provided by compliance with the current national ambient air quality standard based on the hourly average ozone concentration. However, the magnitude of the responses we observed at 0.12 part per million suggests that we probably would observe responses at lower ozone concentrations.

However, this requires further investigation. We are presently conducting studies employing the 6.75 hour protocol which I just described with exposures to clean air, 0.08, 0.10, and 0.12 part per million ozone. Results from this on-going study will extend our knowledge of the effect levels for ozone-induced responses, especially lung function, respiratory symptoms and nonspecific airway reactivity.

Upon completion of these studies, we also plan, to investigate other health end points, especially indicators of airway inflammation and permeability at the lowest effect levels observed for increases in nonspecific airway reactivity.

Thank you.

Senator MITCHELL. Thank you, Dr. Horstman. We will now hear from Dr. Homer Boushey of the American Lung Association. Dr. Boushey, welcome.

STATEMENT OF HOMER BOUSHEY, JR., M.D., AMERICAN LUNG ASSOCIATION

Dr. BOUSHEY. Thank you, Mr. Chairman. Since I have submitted a written copy of my testimony, I simply would like to summarize the major points of what I have to say.

My most important message is that the ambient air quality standard for ozone is a sensible and reasonable interpretation on scientific data of ozone's effects on the respiratory system. The easiest data to interpret are those provided by studies of people acutely exposed to ozone, as Dr. McDonnell so well summarized.

In people performing light exercise, 0.30 part per million, a level still sometimes exceeded in some of our cities, causes chest pain, a fall in vital capacity, narrowing of the airways and an increase of the sensitivity of airways to other inhaled irritants. We know from obtaining bronchial fluid by bronchoscopy that these changes are associated with an influx of white blood cells. Similar inflammation of the airways usually occurs with bacterial or viral infection. With more vigorous exercise, these changes can be seen with exposure to lower levels of ozone, at about 0.15 part per million. This may be why performance at high school track meets in Los Angeles correlates negatively with the level of ozone in the atmosphere.

You have also just heard from Dr. McDonnell that about 20 percent to 30 percent of the healthy population seem unusually sensitive to ozone.

To summarize the studies of the effects of acute exposure to ozone, it appears that symptoms, changes in lung function and inflammation of the airways occur in people exercising vigorously while breathing levels just above the current standard. People who work out of doors and kids who play out of doors are the ones most at risk.

The studies of animals are also quite consistent. Prolonged exposures of monkeys, rats or dogs to levels of ozone about 0.25 to 1.00 part per million of ozone cause changes in pretty much the same place, in the terminal airway. That is the junction of the conducting part of the lung to the part of the lung where gas exchange actually takes place. At this site, inflammation and fibrosis occurs. in animals chronically exposed to ozone. This is also where we think emphysema and bronchitis begin in cigarette smokers, so we are concerned that cigarette smoking and ozone may interact to cause lung disease.

Epidemiologic studies of populations are not quite so clear-cut, but it does appear that the attack rates of asthma correlate with the levels of ozone just above the current standard.

It also appears that prolonged residence in the more polluted parts of the Los Angeles basin is associated with more rapid deterioration in pulmonary function. The effects look something like accelerated aging of the lungs. The longest study I know of is now only in its eighth year, so we don't know whether this more rapid deterioration in lung function predicts the development of symptomatic impairment.

An even more difficult question is the possible interaction between ozone and other agents like cigarette smoke, viruses that infect the airways, and allergens. Perfectly plausible rationales can be put forth for suggesting that there are such interactions, and some animal studies support them, but they haven't yet been proven in people. This may be one reason for setting standards that provide a margin of safety. We are dealing with a pollutant to which millions of people are involuntarily exposed, so it is prudent to set a standard that minimizes the risk of plausible, even if unproven, hazards.

In summary, the current ambient air quality standard for ozone is a sensible interpretation of the available evidence. The problem is that 60 areas are in nonattainment with the standard. The EPA projects that 35 of these will remain in nonattainment for 5 years or more given their current control efforts. This is a serious problem. But I think it is one that is essentially political rather than scientific. The scientific data indicates that easing the standard is not an option.

The American Lung Association, therefore, urges you and Congress to review the nonattainment program and to determine what steps are necessary to help these areas meet the standard. Both the lung association and its medical section, the American Thoracic Society, would be delighted to help you in resolving this complex problem.

Thank you for this opportunity.

Senator **Mitchell**. Thank you very much, Doctor. Before hearing from the next witness, I would like to recognize the presence of Senator Baucus, who is a distinguished member of this committee.

Senator, do you have an opening statement?

Senator **Baucus**. No statement. Thank you.

Senator **Mitchell**. Thank you very much. We will next hear from Dr. Carmia Borek, Professor of Pathology at Columbia University.

Dr. Borek, welcome. We look forward to your testimony.

STATEMENT OF CARMIA BOREK, PH.D., PROFESSOR OF PATHOLOGY, COLUMBIA UNIVERSITY

Dr. **Borek**. Mr. Chairman, members of the committee, I am Carmia Borek, Ph.D., Professor of Pathology at Columbia University in New York. I appreciate the opportunity to testify before you on the health effects of ozone. The identification of environmental pollutants with carcinogenic potential is of relevance to human health.

We have made a study to test if ozone is carcinogenic in mammalian cells. This included the effects of ozone in the absence and presence of ionizing of radiation. Radiation itself is carcinogenic. The combined experiments were to test whether ozone and radiation are synergistic in their carcinogenic action.

Cell cultures lend themselves well to testing potential carcinogens. Cells transformed in culture by carcinogens produce tumors in animals. This permits us to measure the effects of agents under circumstances that are not possible in clinical research.

In experiments designed to test the cancer-causing ability of ozone, control animal cells were exposed to air, and test cells were exposed to air containing 5 parts per million of ozone for 5 minutes or ozone tests radiation.

We found that ozone causes cells to become cancerous. Control cells showed no change. We also found that ozone enhances the cancer-causing effects of radiation in a synergistic fashion. The treatment of cells with ozone also resulted in chemical changes in the cells. We found enhanced levels of products in the ozone exposed cells as compared to controls. These were products of lipid peroxidation.

These products are free radical intermediates which damage DNA and can be carcinogenic. In summary, our findings indicate that 5 parts per million of ozone can convert sensitive animal cells to malignancy. Our work also shows that ozone enhances the carcinogenic effects of radiation.

Additional research is required to investigate the potential of ozone as a cancer causing agent. It is important to investigate if the cancer causing effect of ozone can be prevented or reversed.

It is important to study the effects of ozone at lower doses and to test its carcinogenic effects in human cells. It is important to find out if ozone enhances the carcinogenic effects of other environmental pollutants.

Our work serves to alert rather than alarm. While it is impossible to eliminate all sources of pollution, it is important to avoid excess exposure to ozone. Previous concern was focused on the immediate toxic effects of ozone. What I believe is at issue is its delayed genetic effects as a contributing factor to cancer in man.

I thank you, Senator Mitchell, for having given me this opportunity.

Senator MITCHELL. Thank you very much, Dr. Borek.

We will now hear from Dr. Christopher Green, who is the head of the Biomedical Services at General Motors Research Laboratory.

Dr. Green, welcome. We look forward to hearing from you.

STATEMENT OF CHRISTOPHER C. GREEN, M.D., PH.D., HEAD, BIOMEDICAL SCIENCE DEPARTMENT, GENERAL MOTORS RESEARCH LABORATORY

Dr. GREEN. Thank you, Mr. Chairman. Good morning. I am head of the Biomedical Sciences Department at General Motors Research Laboratories, and we are very happy to be here to share with you some of our thoughts and discuss with the subcommittee our views on health effects of ozone and carbon monoxide.

I am going to summarize the more detailed statement we have provided and then we will all take questions, of course.

Senator MITCHELL. I think that your view is probably different from that that has been expressed, so if you want to take a few more minutes, we want to have a fair hearing here. So you take whatever time you feel is necessary.

Dr. GREEN. I appreciate that, Mr. Chairman. In point of fact, I am here really as a scientist more than a representative of the automotive industry. I would initially like to preface my comments by saying that I would like to associate myself in general with the views of the scientists that have gone before me.

Senator MITCHELL. Then stick to 5 minutes.

Dr. GREEN. I think in about 30 minutes, I should be able to associate myself with their views.

Senator MITCHELL. Now we will take 20 minutes for the qualifications.

Dr. GREEN. With regard to ozone health effects, I would like to make three general observations. First, we applaud the programs that we have heard discussed today and the others, as well. Those that are underway are, in fact, geared to gain a better understanding of what the reality is concerning ozone health effects, particularly in man.

In our laboratories in Michigan, we have had complimentary research going on that is similar to this for the past 7 years, and in fact, to date, our programs on auto effects programs include about 40 scientific man years over the last 6 or 7 years. We have been employing an increasing collegial association with scientists elsewhere in the last several years, and I intend to continue that process.

Second, I think we need a better understanding of the existing data, as several speakers before me have pointed out, in terms of looking at potential health effects to avoid pitfalls that primarily are related to extrapolation of what initially was high-dose animal to low-dose human responses or exceptionally high-dose cell culture effects to low-dose or ambient level human responses.

We recognize that ozone inhaled in high concentrations may represent a hazard to human health. However, the responses of the respiratory system to low ambient concentrations at or about current standard don't appear in our view to produce the same changes as high concentrations in those other studies, either in terms of quality or in terms of quantity of response.

Third, even if we are able to measure the changes and the responses at the low-level exposures, and in some cases we can, particularly under high levels of exercise in healthy people, we have to be careful in the interpretation of these changes so that we don't end up relying solely on statistically significant as opposed to clinically significant events that we can't really interpret otherwise.

Based upon our research and analysis of the world literature on this subject, including our review of the excellent EPA criteria document which I know that you are aware of, we don't believe that clinically significant health effects are produced by exposures to ozone concentrations at or near the current standard.

The EPA criteria document and some other research that we have heard about today does report deviations in the measurements of pulmonary mechanics of individuals during unusually heavy exercise, and it also recognizes that the reasons for these effects are unclear.

As the criteria document points out, there is a growing body of experimental evidence that suggests that these symptoms may represent a type of temporary reaction that is moderated by neural reflexes to ozone exposure.

We understand that the EPA has recently completed the research that simulates the situation of workers performing heavy manual labor outdoors. This exposure was at low level concentrations in the current air quality standard of 0.12 part per million over a continuous 6.5 to 7-hour period. The data do indicate statistically significant changes in lung function.

But in view of the above mentioned temporary character of these changes, it is not clear to us yet whether such data would indicate what would constitute an adverse health effect.

Our own studies in my laboratories indicate these changes, even when humans are exposed to levels much higher, at or about four-tenths part per million, are temporary and disappear when the exposure ends. We are looking forward to examining the EPA data in a process that will begin in about 2 months to look at the standard.

Turning to carbon monoxide for a moment, there is even a more compelling case that has been made that the health risks that are faced by persons living in nonattainment areas are less significant than previously thought. There has been controversy over health effects of exposure to various levels of carbon monoxide today, and it centers on data from limited studies from laboratories which relate carbon monoxide levels to chest pain associated with angina attacks.

These studies basically assert that small amounts of carboxyhemoglobin in the blood of angina patients causes a decrease in their ability to withstand extended exercise without experiencing anginal pain or discomfort. After extensive review of these data, we believe the studies of extended carbon monoxide effects so far produced in literature are deficient on several grounds.

For example, there is an inadequate cognizance of the mechanism of toxicity and a lack of confirmation so far in the peer reviewed literature by the laboratories, and we are not alone in this assessment.

A panel of independent blue ribbon scientists that were appointed by the EPA to review the carbon monoxide angina data recommended, in fact, that the EPA not rely on the data in the standard-setting process. Now, if these data are, therefore, disregarded, nearly all the available scientific evidence indicates that there is no clinically significant adverse effect from low level carbon monoxide exposures with regard to the general population, including potentially susceptible groups.

The scientific community has been very much concerned about the validity of experimental data upon which the current standard is based. As a result, and most importantly, the Health Effects Institute has begun, at the request of the EPA, a verification study on the effects of carbon monoxide.

The HEI is a blue ribbon panel of scientists, and they are jointly funded by the auto industry and the EPA. The project that I have just referred to is a multi-million dollar study, and it is expected to provide a final assessment later this year, well before the EPA is scheduled to re-evaluate its decision on the carbon monoxide standard in February 1988. We are anxious for that process to continue.

In summary, the scientific community as well as General Motors shares your Subcommittee's interest and concern with regard to the protection of public health and nonattainment of the national ambient air quality standards for both ozone and carbon monoxide.

However, in our best judgment, we believe that the consequences of our nation's failure to meet the standards for these pollutants with respect to health effects have been the subject of considerable overstatements. We recognize that the data upon which the scientific community relies could be subject to differing interpretation.

I note that the EPA has a regulatory and criteria review process that is currently very active in assessing health effects and exposure to various levels of ozone and carbon monoxide, and we congratulate the EPA on these efforts, and we look forward to working with them in the next months and years on exactly these issues.

Thank you.

Senator MITCHELL. Thank you very much, Dr. Green. Before proceeding to the next witness, I would like to recognize two other Senators have arrived.

Senator Lautenberg, do you have an opening statement?

Senator LAUTENBERG. Mr. Chairman, a short one which I will save in connection with the questioning.

Senator MITCHELL. Thank you very much.

We are pleased to have the distinguished former chairman of this committee with us, Senator Stafford.

Senator STAFFORD. Thank you very much, Mr. Chairman. I have no opening statement, either. I am grateful to you for having these hearings, and I look forward to hearing the rest of the witnesses. I regret that I was unable to be here for the previous statements.

I will place Senator Pressler's statement in the record at this point.

[The statement referred to follows:]

STATEMENT OF HON. LARRY PRESSLER, U.S. SENATOR FROM THE STATE OF SOUTH DAKOTA

Mr. Chairman, thank you for scheduling this hearing on the health effects of ozone and carbon monoxide. It is critical that the committee include discussion of health effects when clean air or any pollution control legislation is considered.

Currently there are more than 70 air quality regions that have not met federal air quality standards for ozone and carbon monoxide. A large share of the U.S. population lives in these large metropolitan areas. If the level of ozone and carbon monoxide in these areas is producing negative health effects, we must recognize that impact. In many cases, Congress looks at the economics or federal cost of various environmental programs. These are short term analyses. If the long term costs are considered, such as increased health care expenditures and the maintenance cost of buildings and other infrastructure facilities, the cost of environmental programs may be a real bargain.

However, in the short term this committee must decide what action should be taken regarding to areas not meeting clean air standards. Information on the health effects of exposure to these two pollutants will be a key factor in this committee's action on clean air legislation.

Mr. Chairman, thank you for scheduling these hearings. I look forward to hearing the testimony of the witnesses.

Senator MITCHELL. Thank you. We will next hear from Michael—is it Schonbrun?

Mr. SCHONBRUN. That is correct.

Senator MITCHELL. Mr. Schonbrun, who is President of the National Jewish Center for Immunology and Respiratory Medicine.

Welcome, Mr. Schonbrun.

STATEMENT OF MICHAEL K. SCHONBRUN, PRESIDENT, NATIONAL JEWISH CENTER FOR IMMUNOLOGY AND RESPIRATORY MEDICINE

Mr. SCHONBRUN. I wish to thank you and the committee for this opportunity to appear before you today. My testimony will concern itself with the health effects of air pollution, particularly carbon monoxide in Denver, Colorado and will, I hope, provide some human dimensions to the issue we are discussing.

The past 5 years, I have been President and Chief Executive Officer of the National Jewish Center for Immunology and Respiratory Medicine, the only research medical center in the United States that focuses all of its energies on lung diseases and immune system disorders. Patients, both adult and pediatric, come to its facilities from all 50 States and many foreign countries. Most are sent by physicians. Investigators from National Jewish receive substantial support from the NIH, including two multi-million dollar pulmonary program project grants in pulmonary disease and the American Review of Respiratory Disease, the world's leading scholarly disease journal in lung disorders, is now edited at National Jewish.

It is no small irony that a research medical community like this one, specializing in lung disease, is located in one of America's most polluted cities. It does, however, make for a very interesting real-life laboratory.

In the last 20 months, I have also been the chairman of the Metropolitan Air Quality Council of Denver. This group is the lead planning agency for the 6-county region that comprises greater Denver. It is composed of leaders from the public and private sector, 20 in all. When then Governor Lamb established it, he instructed us to concentrate on Denver's carbon monoxide problem, the worst in the United States at that time out of 305 urban communities.

On those days when Denver is suffering through an especially bad episode of air pollution, the patients at national Jewish call us to complain. They tell their nurses; they tell their doctors; they tell the hospital's administration. Some of our outpatients call to cancel their clinic appointments. They are simply not feeling well enough to travel. Their complaints specifically center on tightness in their chest, of dizziness, and of headache.

It should be noted, again, that virtually all our patients have something wrong with their lungs. About 70 percent have asthma; about 10 percent have emphysema, and it must also be noted that these patients are tough cases. The treatment failures who come to Denver from the East Coast from the Mayo Clinics and the Mt. Sinais. So I am talking here about the very sensitive population.

Another noteworthy occurrence occurs on high pollution dates at National Jewish. Our doctors tell our patients, "Do not exercise outdoors today."

Now, the committee needs to know that exercise and physical fitness are key components in the treatment region at National Jewish, so this advice is given very reluctantly, indeed.

One other key fact must be brought to your attention this morning, and it is this: The metropolitan Denver area has an age-adjusted death rate from asthma, emphysema, and other chronic obstructive lung diseases that is 30 percent worse than the national norm and is in the worst 10 percent of the country.

There are several possible explanations for this troubling statistic, but at a 3-day conference held this past summer in Keystone, Colorado, a group of nationally prominent epidemiologists, toxicologists and pulmonologists determined that air pollution could well be the leading cause for this figure which was produced by and validated at the highest level of statistical certainty by the United States Department of Health and Human Services.

A monograph published last year by the National Academy of Sciences featured a map that showed possible hot spots in the United States for air pollution-triggered lung disease. Denver was one of a dozen areas so highlighted.

Now that I presented these facts to you, I must address the question of the pollution itself. The Metro Denver area has had compliance problems with particulates, oxides of nitrogen and ozone as well as carbon monoxide.

Currently, we are within acceptable levels for NOX and are close to attaining that level for ozone. Health concerns arising from air pollution occur in Denver, mostly during the winter months, and that is the high season for carbon monoxide and the "brown cloud," as we all call our particulate problem.

Much is not known about the composition of the brown cloud: Where it comes from, what its precise components are, where it is on bad pollution days and where it moves. Much better information is available in the specifics of carbon monoxide in Denver.

We know, for example, that 75 percent of the CO in Denver comes from automobiles, and the number of vehicles is growing rapidly there, even though Colorado's economy has been sluggish for the past few years. We know also that CO is at ground level, where the people are breathing it in.

We know also that its highest concentrations are found in the downtown, where people come in to work and where many of the region's poor live; and we know, too, that a zone of high CO pollution stretches beyond the immediate downtown area to adjacent areas, including most of the cities hospitals, housing many patients whose cardiopulmonary conditions have already been compromised by their illness. National Jewish happens to be in this area.

While I have been among those calling for additional research into the composition of Denver's brown cloud and also for further study into the health effects of air pollution at altitude, topics that have received pitifully little quality attention to date, I believe that the current information we now have available to us, the epidemiological data, the laboratory data and the real life case studies from National Jewish I referred to, tell us that air pollution in general and carbon monoxide, in particular, are dangerous to human health at the levels found in Denver and that aggressive actions must be taken to reduce the ambient levels of air pollution in our cities.

The fact that we lack all the data we desire to make the most precise policy calls should not result in backsliding now that deadlines are fast approaching.

If we must compromise, let's do so on timetables and not on standards.

Thank you.

Senator **Mitchell**. Thank you, Mr. Schonbrun. Our final witness before we go to questions will be Dr. Bernard Goldstein.

Doctor, before we hear from you, I would like to recognize the presence of Senator Graham.

Senator, do you have an opening statement to make?

Senator **Graham**. No opening statement, Mr. Chairman, thank you.

Senator **Mitchell**. Dr. Goldstien is a professor, a Chairman of the Department of Environmental and Community Medicine, University of Medicine and Dentistry of New Jersey, Robert Johnson Medical School.

You have a long title, Doctor. Welcome.

Dr. **Goldstein**. Yes, I do, sir.

Senator **Mitchell**. I took 2 of your 5 minutes just to read your title.

We will give you ample time.

STATEMENT OF BERNARD GOLDSTEIN, M.D., PROFESSOR, AND CHAIRMAN, DEPARTMENT OF ENVIRONMENTAL AND COMMUNITY MEDICINE, UNIVERSITY OF MEDICINE AND DENTISTRY OF NEW JERSEY, ROBERT WOOD JOHNSON MEDICAL SCHOOL

Dr. GOLDSTEIN. Thank you, Senator. Let me start by saying I think you are absolutely right in giving Dr. Green additional time. I find his point of view does differ from the one that I will express and some other members of the committee have expressed. Let me start with carbon monoxide.

The subject is not one for pride among those of us who have been involved with the interface between science and regulation concerning air pollutants. The original standard was based upon a single report which suggested that people had psychomotor deficits upon being exposed to relatively low levels of carbon monoxide.

After the standard was set, it was found that this could not be replicated. However, the standard was supplanted by information concerning the effect of carbon monoxide on people with cardiovascular disease with impaired cardiac function.

This also has faced some difficulty. The scientific group that produced most but not all of this research was headed by an individual who subsequently admitted that, at least for other research, he had been somewhat loose with the data. I agree with Dr. Green that the scientific blue ribbon panel started by EPA did review this data and did suggest, in fact, direct, if you will, that in essence, the numerical findings in this data base should be removed.

However, there are other data. There is at least one other study performed by EPA which did show that there were effects of carbon monoxide in people with impaired cardiac function.

Let me emphasize that the Clean Air Scientific Advisory Committee of EPA reviewing this data without the Aronow data base recommended that no change be made in the standard. And I think that it is important to look at why that recommendation was made, look at why we have a situation which is not just simply the legalistic removal of certain data and therefore, we no longer have to consider this as a problem.

I think that really is based on an understanding of how carbon monoxide functions and how the heart functions. Carbon monoxide simply interferes with the delivery of oxygen from red blood cells. The heart, in turn, of individuals having vascular heart disease cannot deliver blood as well to the heart for it to work, simply because there is the narrowing of the coronary blood vessels.

That is a particular problem for the heart. If you consider exercise in its usual sense, if you consider a muscle that is exercising, there are really three ways we can get more oxygen to that muscle as it exercises. We can extract more oxygen from the arterial blood that is going through; we can have the heart work harder to pump more blood to that muscle; or we can dilate the blood vessel in the peripheral muscle, in the calf or biceps.

The heart, however, has only one way that it can get more blood, really. The heart is maximally extracting the oxygen that goes past it in all situations. The heart cannot pump harder and get more oxygen to itself. That is sort of a counter-productive effect: You have to work harder to get more oxygen to work harder. So that gets you nowhere.

It really is dependent upon dilating its blood vessels. People with angina syndrome simply cannot dilate their blood vessel. It makes every sense to those of us in the scientific community that have looked at it that those people will have an impaired ability to exercise, to withstand stress in situations where there is carbon monoxide in the blood.

The question is what level of carbon monoxide will this be occurring at? The question, at least to me, is not whether it will occur. It is simply a question of what level. Dr. Green is absolutely correct when he states the Health Effects Institute has put together an excellent group of people to do research in this area. I can only tell you that it simply is a matter of waiting for this research to come through.

I cannot tell you, I cannot predict really what this research will show, but I do not think that now is the time to be considering changes in the carbon monoxide standard.

Let me change subjects for a moment and talk about the ozone standard. I appreciate the opportunity to be able to do that. I want to restrict my remarks to the need for an 8-hour, or thereabouts, averaging time for ozone rather than the 1-hour averaging time that we usually use. The ozone standard was set for 1 hour based upon some data in southern California in the 1960's. The first description of ozone showed a sharp 1-hour peak occurring somewhere around noon. This simply does not seem to occur in most of the country, including even in southern California, now.

We have done a study where we have shown for the State of New Jersey and also for the Netherlands that when we have ozone episodes there, the ozone episodes tend to last 6, 8, or 12 hours and tend to persist for perhaps days. Again, we believe this pattern is probably true for most of the country.

You have heard about the toxicology of ozone, the fact that we are concerned about it producing chronic effects. You have also heard about the studies that Dr. Horstman demonstrated on a 6½-hour exposure and its rather strong effects at the level of the current standard.

We would suggest to you that it is very important for EPA to focus on a 7-hour time frame a 10-hour, 9-hour, something in that range, rather than the current 1-hour standard. We believe that this is particularly true in the sensitive population that we are concerned about. The long-term effects that we are concerned about in the sensitive population is such that when the ozone effects occur, when we have those lovely summer days with 8 hours of ozone, we can expect that there are literally hundreds of thousands of children who are going to be out there playing, exercising during that 8-hour period.

Thank you.

Senator MITCHELL. Thank you very much, Dr. Goldstein.

We will now proceed to the questioning. We will limit the questions and answers to 5 minutes per Senator on the first round, and we will proceed in the order in which the Senators arrived.

Dr. McDonnell, at pages 11 and 12 in your statement, you discuss two areas that seem to be troubling to you, acute effects and the effect on lung inflammation and long-term exposure at lower levels. If the research now underway confirms the data already collected on the health effects of ozone, in your personal opinion is there a more stringent standard necessary to protect the public health?

Dr. McDONNELL. That is a difficult question. I will attempt to answer it. First I want to say that there is certainly more than just health effect information that needs to go into setting of the standard in terms of the number of people exposed and that sort of information on which I am not an expert, but I will talk about the health effects at these given levels.

I think the current standard for 0.12 for an hour, given what we know at the present, is probably a prudent standard and is adequate protection. If we find in these 8-hour studies that we are seeing acute effects now at levels below the current standard, and let's say, for example, we were to find an effect with 8-hour studies or 6-hour studies at 0.10 or 0.08 part per million, then I think that perhaps we would need to reconsider the question.

Regarding the question of how the standard should be set and at what level it should be set, I don't think at the moment that we have the data to actually pick a number or to pick a change in the standard. I think that that data is going to be forthcoming very shortly so that we will be able to make a better attempt at that.

Senator MITCHELL. Could I ask each of the other witnesses to comment on the appropriateness of the current standard? We can go in the order that you testified. That might be easier. Dr. Horstman?

Dr. HORSTMAN. Yes. I think the current knowledge that we have strongly supports the standard where it is, at 0.12 part per million for an hourly average. I think the additional studies that we have recently completed with more prolonged exposures also support the level of the current standard. I think within the next 2 or 3 years, though, we will have to consider some other levels. The data is not available yet and I think we should wait the 2 to 3 years to see what the data reveals, then consider the issue of alternative standards.

Senator MITCHELL. Thank you, Dr. Horstman.

Dr. Boushey?

Dr. BOUSHEY. I believe that with the current evidence indicates the current standard adequately protects human health. My concern is with the large number of areas that cannot comply with the present standard.

Senator MITCHELL. Dr. Borek?

Dr. BOREK. So far, we know of no late or delayed effects at the current standard level. We have not yet carried out experiment nor has anybody else carried out any experiments to see whether ozone is potentially carcinogenic at that low level. So as far as we know, it is still okay, until proven otherwise.

Senator MITCHELL. Dr. Green?

Dr. GREEN. I think that the current standard is medically appropriate. In our labs, we are trying to ratchet down experiments with human subjects to find the level at which prolonged exposure with heavy exercise with young people and with asthmatics who would be in a susceptible group do, in fact, show, recognizable changes that we can repeat.

At the moment, our studies are at four-tenths, and we haven't gotten to the point yet where we are anywhere near the standard of 0.12. So I agree with everything my colleagues have said. I think based on both laboratory data with human subjects, clinical data and the animal studies, as well, it is about where it should be.

Senator MITCHELL. Thank you.

Mr. Schonbrun?

Mr. SCHONBRUN. Very briefly, I would say that the current standard is appropriate. The hour standard that was mentioned by Dr. Goldstein would make a good deal of sense, I think.

Senator MITCHELL. Dr. Goldstein?

Dr. GOLDSTEIN. I would point out, sir, that the current standard was set under the Clean Air Act as to have an adequate margin of safety. Quite clearly, the Administrator at the time had to consider the potential for chronic effects as a reason for a margin of safety for ozone. If one had in addition an 8-hour, or however much longer it would be, the chronic effects could be dealt with under the longer term standard and the 1-hour could be restricted for the acute peaks.

One could even argue that in 1977 or whenever that last standard was set, it could have been higher than 0.12 if there was a longer time standard then. I would point out, however, that new data has occurred since then.

Senator MITCHELL. Thank you.

I will yield back my time to go to the questioning of Senator Baucus.

Senator BAUCUS. Thank you. Gentlemen and Dr. Borek, what concerns me is you all agree. I am serious about that. The law requires that standards be set at a level requisite to protect public health with an adequate margin of safety. You are all saying a 0.12 hourly standard does that; that is, it protects public health with an adequate margin of safety. You all said that.

Dr. BOREK. No.

Senator BAUCUS. You all think that. I see one man shaking his head. Dr. Goldstein, why are you shaking your head negatively?

Dr. GOLDSTEIN. Again, I am concerned about chronic effects of ozone. I think that is a critical concern that we have had for 20 years, and unfortunately, we haven't come that much closer to becoming absolutely certain that there are going to be long-term disease effects of ozone. I think you need a good margin of safety for that.

I am not convinced that 0.12 part per million of ozone for 1 hour when people are actually being exposed for many hours a day under particular conditions of exercise, and particularly young people, is an adequate standard. I don't know that 0.12 is too high or too low. I do know that we have run into trouble in the past when we have used the wrong form of the standard such as with particulates and led to the kind of controls that we know we spent a lot of money and we are simply not able to get at the problem.

Senator BAUCUS. Dr. Green?

Dr. GREEN. A number of my colleagues have hit on the point that Dr. Goldstein just alluded to, and I would like to extend it just a bit. I think that a number of the issues that your questions are driving toward really relate to the field of chemistry as much as they do to health effects associated with control studies of ozone. I don't think that any of us as physicians or scientists feel comfortable that under a multiplicity of breathing of pollutants in worst-case scenarios that chronic exposure wouldn't lead to something that would be very bad.

If we could parse from those questions, what, in fact, was related to what we believe may be long-term chronic effects, we might be able to help you a bit more in suggesting one standard or one compound that should be set.

In general, I don't think that as a group, we believe that those effects necessarily are related to ozone. If they are, we don't yet have any chronic data that would indicate what the level should be besides what it is.

Senator BAUCUS. How much research have you undertaken to give you a very high degree of confidence that the present standard is sufficient? I sense that a lot of your research is preliminary. In fact, you basically said so.

Dr. HORSTMAN. I think the reason most of us agree that 0.12 part per million might be an adequate standard independent of the issue of a margin of safety, is that during the past 5 or so years there have been a great many studies directed at that particular level or levels close to 0.12 part per million. Thus, we could make valid assumptions about what actually happens, at or near the current standard.

We feel that the data base is fairly solid at about 0.12 part per million. That is one of the reasons we feel we don't need a extensive margin of safety for ozone, because we have the available data.

Now, regarding the issue of more prolonged exposures, because we have additional studies which will be available to us over the next 2 or 3 years, it would probably be more prudent to wait to see the results from those studies before dealing with this particular issue of a longer term standard.

Senator BAUCUS. That is a different question. Do all of you feel there is sufficient research now to be undertaken or soon to be undertaken that will address whether or not the degree to which standards should be lower?

Dr. HORSTMAN. No. Just one additional comment. I think there is new—I will use the term—medical technology. There is actually new methodology which allows us to examine things at the cellular level; actually look at indicators of tissue damage in the lung. These types of measures were not available to us 5 years ago. I refer to some of the studies that are being done in Dr. Boushey's lab and some of the studies that we have begun in our own lab using alviolar lavage. With this procedure we actually look at the cells and other substances in the lung after an exposure to ozone.

Mr. SCHONBRUN. I have just one more comment. There are additional questions that may well exist in those areas that are at altitude. In Denver, for example, at 5,000 feet, there is about 20 percent less oxygen in the air than we have at sea level. There are also differences in respiratory function, and the amount of research that has been undertaken at altitude conditions really has been, in our opinion, inadequate. There has been some work done in California at their high altitude site, but in the west, not only are those areas in the mountains, but, also in the plateaus at 4,000 and 5,000 feet. It is only about 2 percent of the Nation's population, Senator, but it is real enough for those of us living and working there. There is not enough attention, we think, and we would encourage more.

Senator BAUCUS. Is there anyone on the panel that thinks the standard should be lower than 0.12. Dr. McDonnell, how about you?

Dr. MCDONNELL. Not with the present knowledge that we have. I think within the next several years, with this information we will have from the longer-term studies, that the standard will need to be reexamined.

Senator BAUCUS. Is that a euphemism, to reexamine?

Dr. MCDONNELL. I don't know what the research is going to show. If I did, I would say that. But we just don't know. I think that for right now, I would say it is at a prudent level.

Senator BAUCUS. Thank you.

Senator MITCHELL. Let me use up the rest of my time by following up what Senator Baucus said. You testified that we are seeing adverse health effects in experiments run at the present standard. If the law requires that the public health be protected with a margin of safety, how can you so testify and then respond that no change in the current standard is appropriate?

Dr. MCDONNELL. What we have done is we have described the responses in the airway or in individuals that are exposed under pretty much worst-case conditions; that is, people who are exercising very hard for a couple of hours.

Where you are going to find a lot of disagreement is over what is considered an adverse health effect. We can certainly measure changes in lung function of 5 percent. What I would say is that, again, there are two levels at which you have to look at these effects. One is the acute effects in and of themselves. What is the potential for causing long-term damage?

We find small changes in lung function at the present standard in very heavily exercising people. I think that is your worst case. At a 5 percent change in lung function, most people are not going to be aware of that. A mild cough, I think, is a matter of interpretation. Do you consider that an adverse health effect, or is it an annoyance?

When you start getting up to levels with severe cough or with 20 percent decrements in lung function, then I think you are actually starting to limit people's performance, and people are really going to complain and people will say, "I am not going to continue my work at this level."

At the present standard, we are talking about the very fewest number of people who are approaching the level at which I would say that these are adverse health effects in and of themselves. That is the acute issue.

Regarding the long-term issue, we have not even established in humans that these long-term effects occur. I think that they would occur if you had sufficient ozone exposure for a sufficient amount of time. That is my opinion. There is no data to support that.

The question is, what sort of low-level exposures would actually give you these long-term effects? I think it is at or above the present standard that people are starting to have some of these cellular changes that, over many years, if they got these exposures repeatedly, might result in these changes.

Senator **Mitchell**. Thank you very much. Senator Lautenberg?

Senator **Lautenberg**. Thank you, Mr. Chairman. First, my compliments for holding this hearing. It is going to give us a chance to develop an understanding of the health effects of ozone and carbon monoxide in nonattainment areas. New Jersey is not expected to meet the Federal ozone attainment deadline, and that is a major problem for my State as well as others. Over 115 million people live in the current nonattainment areas.

Today's witnesses have given us some evidence of the health risks of ozone. I note that our distinguished panel includes someone from New Jersey. We are pleased to have here Dr. Bernard Goldstein.

Dr. Goldstein, as you noted, Mr. Chairman, is the Chairman of the Department of Environmental and Community Medicine of the University of Medicine and Dentistry of New Jersey, and he formerly served as an Assistant Administrator for Research and Development at EPA. I welcome you here, Dr. Goldstein.

I just want to ask you a couple of quick questions. Your written testimony suggests 8-hour exposures to ozone in New Jersey at about 100 parts per million. Could you tell us in fairly simple terms, if you will, the kind of health problems that these levels might cause?

Dr. **Goldstein**. Sir, I think we have heard from Dr. Horstman and Dr. McDonnell. We are really concerned that at levels that are pretty close to the existing standard that we are going to be getting when people are exercising, particularly children are exercising all day, that we will be getting the kind of cough, tightness of the chest, the kind of effects that we certainly want to avoid.

We do know that in the past, New Jersey has had a couple of episodes of children being hospitalized for no apparent reason during beautiful summer days which, in retrospect, people say, "Oh, there was a lot of ozone there." We were never really sure whether it was due to ozone. It never happened near an air monitoring site. But it kind of fits in with the type of data Dr. Horstman has told us about today.

We did find in our studies that on about a quarter of the days that we in New Jersey exceeded more than 0.10 part per million, very close to that standards for an eight-hour period. We did not exceed the 0.12 part per million 1-hour standard.

So you get a pretty flat exposure, very close to the existing standard, not in exceedance of it. But yet we have 8 hours, right up to it. We somehow or another do not believe, particularly after hearing Dr. Horstman's data, that that is appropriate, under the Clean Air Act, to have children out there exercising.

Senator **Lautenberg**. On those days when the measurements were that high, were we able to correlate specific incidents of the problem? Did we see more people going to the physician or the hospital?

Dr. **Goldstein**. We have never looked, sir.

Senator LAUTENBERG. Wouldn't that be a fairly simple thing to develop data on?

Dr. BOUSHEY. May I speak to that point? The Houston area oxidant study examined that question in people with asthma and found a correlation between emergency room visits for asthma and levels of ozone. The ozone levels ranged around .125 parts per million, slightly above the present 1-hour standard.

Senator LAUTENBERG. So there is a concern about the constancy of exposure going beyond simply the levels of exposure.

Dr. GOLDSTEIN. Yes, and there is the concern that ozone produces radiation-like effects. That is the best way of describing it. Dr. McDonnell used the example of sunlight, which I think is a good example, which we would predict on a toxicological basis ought to be something that produces chronic effects.

That doesn't mean that we know ozone produces chronic effects, but it is certainly something that is worrisome. It is certainly something that belongs in a margin of safety when one looks at the setting of the ozone standard.

Dr. HORSTMAN. You have heard Dr. Green say that these effects are temporary and they go away and if you repeat them several times they don't come back. The thing that concerned me with the longer-term exposures were the changes in reactivity that we observed. Because of the association that has been made between reactivity and inflammation. If there is eventually going to be a basis for chronic changes, inflammation can certainly be at that basis.

Changes in reactivity that have been observed are really suggestive that inflammation was occurring and there is potential for chronic changes.

Senator LAUTENBERG. You are challenging Dr. Green's view on that. Dr. Goldstein, do you think that some of the problems that we have in New Jersey are a result of interstate pollution?

Dr. GOLDSTEIN. Yes, sir, and I think some of the problems they have in Connecticut and New York are also due to interstate effects, perhaps caused by us.

Senator LAUTENBERG. So we ought perhaps not to leave it. We will drop that part of it.

There is a hole in the sky. Certainly, we ought not to consider that regulation within the State is going to take care of the problems for either the residents of that State or neighboring States, as well.

Dr. GOLDSTEIN. Yes, sir.

Senator LAUTENBERG. Thank you, Mr. Chairman.

Senator MITCHELL. Thank you, Senator Lautenberg. Senator Stafford?

Senator STAFFORD. Thank you, Mr. Chairman.

Let me address a question to the entire panel. A few days ago, an editorial appeared in the Washington Post which contained the following statement with respect to the impact of air pollution on human health. I will quote one sentence from that editorial. It said, quoting,

> Pollution has already been cut to a point at which it no longer appears to threaten human health.

I would like to ask each of you, in your professional opinion, to comment on whether you believe that sentence is an accurate statement.

Dr. Borek, I would like to start with you.

Dr. **Borek**. I am sorry. Could you repeat the quote?

Senator **Stafford**. Certainly. I am willing to repeat it several times. Quoting again,

> Pollution has already been cut to a point at which it no longer appears to threaten human health.

Dr. **Borek**. No, I don't think so. I cannot agree. With respected to ozone, our studies have shown that it is possibly a potential carcinogen and that it enhances the effects of radiation in terms of its carcinogenic potential. Therefore, we cannot regard this as having been checked, because more studies have to be carried out at different doses to see what is the case. The answer is no.

Senator **Stafford**. Thank you.

Dr. Boushey?

Dr. **Boushey**. Every so often it is important to remember that we have made a lot of progress. The air pollution epidemic in London in 1952 caused a death rate that had not been exceeded since the influenza epidemic of 1916 to 1918.

The Clean Air Act of this country has accounted for tremendous progress, and we no longer have those crises in which there is an acute dramatic increase in mortality over a few days. So we have made a great deal of progress, and I think the Clean Air Act is really responsible for that progress. I think, however, that the statement goes too far.

There are too many areas that have not attained our air quality standards for that statement to be made. Perhaps the writer of the editorial should visit a highly-polluted area on a bad summer day and reconsider.

Senator **Stafford**. Maybe we should ask the editor to go to Denver. Dr. Green.

Dr. **Green**. No, I can't agree entirely with that quote. I could, I suppose, argue that strictly speaking, it is okay because it uses the word "apparently" or some such qualifier.

But I think in general, I agree with what Dr. Boushey has said. The issue is not one of whether pollution harms people; it is where that pollution is and what that pollution is. That is a separate issue from that of standards.

Senator **Stafford**. Thank you.

Dr. McDonnell.

Dr. **McDonnell**. I also disagree with that statement. I think if air quality met the present national standards that perhaps that statement might be true. However, with the large number of areas that are out of compliance with the present standard, particularly with regard to ozone, I think that there are probably considerable health effects.

Senator **Stafford**. Thank you, sir.

Dr. Horstman?

Dr. **Horstman**. I would like to qualify this. This is my opinion, I vehemently disagree with that statement.

Senator **Stafford**. Thank you.

Dr. **Goldstein.** Perhaps not so vehement, but I certainly do disagree with it.

Senator **Stafford.** Mr. Schonbrun?

Mr. **Schonbrun.** We could always use more visitors to Denver. Let me say that based on the data that I mentioned, that we have here, Denver happens to have not only a very bad CO problem, as mentioned, but a very bad particulate problem. Regarding the data that I mentioned on chronic pulmonary disease death rates, it also needs to be noted that we have a lower than normal rate of cigarette smoking so something is causing this high death rate, and we would suspect that air pollution is a large part of that.

Senator **Stafford.** Thank you.

For the two witnesses from the Environmental Protection Agency, I have a question which involves reacting to a report. An abstract of that report is being distributed to you now. I would ask you for your reaction to this report and the reaction of any other witness who cares to respond in writing rather than to try to do so presently.

[The abstract and a response from Dr. McDonnell follow:]

PULMONARY FUNCTIONAL AND MORPHOLOGICAL CHANGES INDUCED BY A 4 WEEK EXPOSURE TO 0.7 PPM OZONE FOLLOWED BY A 9 WEEK RECOVERY PERIOD

(Kenneth B. Gross and Harold J. White, Biomedical Science Department, General Motors Research Laboratories)

ABSTRACT

Male Fischer-344 rats (C-12, E-11) were subjected to pulmonary function testing procedures. The experimental group was then exposed to 0.7 ppm ozone for 28 days, 20 hours/day and both groups were tested at the termination of the exposure and after four and nine weeks of recovery in clean filtered air. Another group of animals (C-6, E-12) was similary treated but at each test point, one-third were sacrificed for microscopic evaluation. When percent changes from pre-exposure values were compared to controls at each time point, the ozone exposure produced obstructive changes in the lung including significant decreases ($p < 0.05$) in forced expiratory flows (MEF_{25} 40.3%, MEF_{10} 70.7%) lung volumes (IC 22.5%, PVC 21.8%), and DL_{co} (20.7%) and a significant increase in functional residual capacity (FRC) (61.1%). The total lung capacity (IC + FRC) was not significantly changed by the ozone. Microscopic examination characteristic lesions in the region of terminal bronchioles and central acinar alveoli marked by peribronchiolar edema, bronchiolization of alveolar duct epithelium, and type II cell proliferation in involved alveoli with increased unmbers of macrophages and a few leucocytes. Clearly discernable was a focal inter-alveolar-alveolar duct reaction made up of fibroblasts, a few inflammatory cells, and conspicuous mast cells, all embedded in a loose metachromatic matrix. After four weeks of recovery all measurements of lung volume and DL_{co} had returned to the values of the control group; but even after nine weeks some of the measurements of lung flow (MEF_{25}, MEF_{10}) remained significantly although less depressed (27.9% and 40.1% respectively). Histologically, after 4 weeks recovery, there remained only a slight unevenly distributed inflammatory reaction. In these foci there was often a residual, narrower, more condensed band of eosinophilic material, presumably collagen, that sometimes contained interspersed mast cells. After 9 weeks, this collagen accumulation within the thickened wall of the alveolar duct could occasionally still be noted. These data suggest that the florid response seen at the end of exposure was related to the obstructive changes measured and that with recovery, the residual central acinar-alveolar duet thickening may be responsible for the persistently diminished air flows.

Comments of William F. McDonnell, M.D. on the abstract by Kenneth Gross et al. handed out by Senator Stafford.

The results of this study indicate that very slowly reversible or possibly permanent changes in lung function and lung structure occur following exposure of rats to

0.70 ppm O_3 for 20 hrs/day for 28 days. The results reported are consistent with results reported by other investigators and suggest that similar respiratory effects may occur in humans. They are exposed to a sufficient concentration of ozone for a sufficient duration of time. The question we would like to answer is what are the minimum conditions producing such change? It is impossible to draw any conclusions about whether these effects occur in humans at our near the present standard of 0.12 ppm from this study. Exposure or rats to 0.7 ppm for 20 hrs/day for 28 days is much too different from situations experienced by humans to be of quantitative value in selecting a standard. It does however, indicate that in setting any standard, the potential for permanent effects to occur from recurrent exposure must be considered.

Senator STAFFORD. I will then turn to Dr. Borek again. Dr. Borek, the conventional wisdom has been that during air pollution episodes, people should stay indoors. These days, we know that many homes have levels of radon. Given your results, my question to you now is, in the light of radon radiation in some houses, should people still remain indoors?

Dr. BOREK. Where are they going to go? That is a good question. The problem of radon, of course, has become very significant recently, and there is some research going on. Much of this is still in progress on the carcinogenic effects of radon. We find, for example, using defined systems of cells and cultures, it is much more carcinogenic than X radiation, for example.

We haven't done experiments yet with the ozone in combination with radon, but it would seem likely that this radon problem is increasing, and so the best solution is to get the radon out of the houses so you can stay at home.

Senator STAFFORD. Thank you, doctor. In my last seconds, you have tried to answer something that Senator Baucus was asking but time ran out. If you remember what that was, I would be glad to hear that now.

Dr. BOREK. Oh, thank you. On the standard. He had asked whether sufficient research is being done to evaluate the standard in terms of health effects, and the answer is no, in terms of the work that I, for example, am concentrating on, namely, its potential as a carcenogenic or a cocarcinogen acting with other agents.

I think it is extremely important now to look at ozone at low levels and so see whether it has this kind of effect, either alone or as an adjunct agent to other air pollutants which would make it an effective hazardous agent in terms that we have not recognized heretofore.

So more research is needed. That is the answer to your question.

Senator STAFFORD. Thank you very much. Thank you, Mr. Chairman.

Senator MITCHELL. Thank you, Senator Stafford.

Senator Graham?

Senator GRAHAM. Thank you, Mr. Chairman. There was reference made to some of the specific issues of high altitude effects. I am concerned with effects on specific population groups. Could any member of the panel comment as to whether persons over the age of 65 would have any different health problems when exposed to the levels of ozone or carbon monoxide that you have indicated here.

Dr. McDONNELL. This is a bit of a complicated answer, but I will try to give it. We have studied people of different ages and people that actually had lung disease, and we are not convinced that older people, that is we do not think that older people necessarily have larger responses than younger people to a given exposure to ozone.

Older people, however, if they do have some sort of changes in lung function, are probably more likely to not tolerate that as well as younger people.

Now, it also turns out that in the studies that I talk about, we had these people exercising at very high levels of exercise. Older people are not going to be able to sustain that kind of exercise; they are not going to then have the effects that are as large in a 1- or 2-hour exposure.

I think a concern that is being raised in our minds with the recent work that Dr. Horstman has presented is that older individuals may be able to sustain moderate exercise for six or eight hours. If it turns out that we are finding that there are effects that continue to get larger with increased exposure, then I think we have to be concerned that perhaps these older people may have effects that they will not tolerate as well as younger people.

Senator **Graham**. Would any other members of the panel care to comment on the specific vulnerability of older citizens? Yes?

Dr. **Boushey**. Do you mind looking at the other end of the spectrum instead?

Senator **Graham**. Sure.

Dr. **Boushey**. It is more the growing lung that I think is of concern. Laboratory studies of animals show a greater vulnerability to nitrogen dioxide during the first few weeks of life. It is difficult to study infants or young children in a research laboratory, so most of the data on human responses have been obtained in adults.

This is perhaps another reason for requiring that standards set a margin of safety. It also appears that in the young, developing lung, oxidants decrease resistance to infections. Infections of the airways seem to predispose not only to asthma, but perhaps to chronic obstructive lung disease later in life.

For these reasons, I am more concerned about the growing, forming lung, than about the adult well-formed lung.

Dr. **Horstman**. One additional comment to support what Dr. McDonnell has said. In an older population, we have no reason to suspect that they are more responsive to ozone. However, in an older population, there is certainly more lung disease, more heart disease. There is certainly a great deal less reserve in these individuals, so that even small changes in functions will be of greater significance to them.

Small changes, you might imagine, would occur in areas where ozone levels might be sustained for longer periods. Even light exercise or activity under these conditions might result in functioned changes. Because of the small reserve, even these small changes could have serious consequences.

Senator **Graham**. The current standards that have been set are essentially nationwide standards without regard to composition of the population or special geographic circumstances. Would it be desirable for EPA, in setting standards in the future, to have variable standards based on geographic, climatic, demographic, or other relevant factors that might vary from community to community?

Mr. **Schonbrun**. I would say that the altitude issue that I mentioned already, Senator, is one that ought to be looked at, because I think that is a fundamental difference. As to the rest of the question, what may be relevant to Florida, I am not so sure about that, although I think there has not been nearly enough analysis of the human dimension, the epidemiological data.

I brought some data with me that I alluded to with regard to Denver, but it showed several metropolitan areas in the State of Florida that have significantly higher than normal death rates from COPD. That is age adjusted. I think that kind of evidence which Senator Wirth's office provided to us was not in the hands of the EPA and not being looked at for that kind of connection. I think we are really at the very beginning, but I think those kinds of facts need to be brought together and prelimary judgements need to be made; more research needs to be done, and out of that may well, in fact, come some new standards.

Senator **Mitchell**. Senator, your time is up.

Senator **Graham**. I am sorry Mr. Chairman.

Senator **Mitchell**. We will go to the next round of questions. Please take five minutes. We will have another round.

In response to my earlier question, all of you indicated that you felt that the current standard was appropriate based on current information but you expected additional information in the relatively near future—2 or 3 years, I think, was the phase used—that should at least result in the reappraisal and may result in suggested changes.

I would like to then ask you what you think about the problem of dealing with nonattainment areas. If you think the current standard is appropriate, then you inevitably must conclude that the 80 million Americans living in areas where the current standard is not being met are being subjected to some adverse health effect.

That is the inevitable conclusion from your response to the earlier questions in southern California, where ambient ozone levels are three times the current standard. Do you agree that based upon your response to the earlier question, that the persons living in nonattainment areas where the ozone levels exceed the current standard are being subjected to some degree of risk of adverse health effect?

Why don't we go in the order that you testified. Dr. McDonnell?

Dr. **McDonnell**. I agree that I think people in areas, for example, where the ozone levels are very high are being subjected to levels that are adverse to health. I think there is no question about that. I don't know how to physically, actually bring these levels down to the current standard. That is what I would like to see done.

Something that I could suggest just in general terms is that I have spoken at a lot of public meetings recently. There are a lot of individuals in society that are not really aware of the magnitude of the problems, and they don't really understand what is going on and the need to bring these levels down.

I suggest that perhaps some more visible public debate of these issues and perhaps some thinking, laying out all the possible alternatives—some of the ways may be radical—would be useful to generate public debate perhaps to encourage people to think about this issue a little bit more.

Senator MITCHELL. Dr. Horstman?

Dr. HORSTMAN. I agree with Dr. McDonnell. I think that it is critical that we reduce ozone levels, especially in areas that are well above the attainment level. If you are going to reduce ozone, you have to eliminate the source. I think we all are in agreement that this indicates a restriction of automobiles. Whether we want to take that dramatic a step, I am not sure. But that is likely where the action is of needed.

Senator MITCHELL. Dr. Boushey?

Dr. BOUSHEY. I am from California where there is air pollution.

Senator MITCHELL. You coughed when you said that.

Dr. BOUSHEY. Pardon?

Senator MITCHELL. Did you cough when you said that?

Dr. BOUSHEY. Pure coincidence. I believe that the population in Los Angeles, where the levels are very high and in the San Francisco Bay area, where the levels are also high, are at risk. While I am a medical scientist, rather than an expert on the political steps that should be taken to encourage attainment, I think some of the steps might include modifications of gasoline pumps to prevent the evaporation of unburned hydrocarbons which contribute to air pollution; greater inspection of vehicles; prohibiting trades of emission reductions; greater emphasis on decreasing the emissions from stationery sources; making sure all new sources have state-of-the-art controls. These measures need to be taken.

Also, I recall the remarkable response of the population of Marin County a few years ago when there was a threat of a severe water shortage. People who had ernoneously viewed Marinites as sybarite interested only in their own pleasure were astounded at the reduction in water consumption, which greatly exceeded the most optimistic projections.

I believe there is a role not just for public debate, but also for public education. A very simple example, is the failure of most people to understand the importance or not "topping up" the gasoline tank when they fill up their car. They don't know that spilling gasoline on the ground contributes to air pollution.

So I believe that public education is needed, as well as public debate.

Senator MITCHELL. Dr. Borek?

Dr. BOREK. I would second that. In addition, I think the public should be aware of what ozone is. For example, in New York, as in Europe, there are many beauty salons which advertise ozone facial treatments. They just give a steam of ozone onto the face, and they consider that something very important. The public has to know what this is doing.

Senator MITCHELL. I think you got caught up in his answer. I want to get back to the question. Do you agree that those persons, an estimated 80 million Americans living in areas where the standard is not now being met, are being subjected to the risk of adverse health effects?

Dr. BOREK. They might be. I think this is something very important to determine.

Senator MITCHELL. Dr. Green?

Dr. **Green**. I don't disagree with what has been said. I think in those nonattainment areas, if we had measurements to proceed, particularly over a period of 6 to 10 hours, maybe longer, of people being subjected to 0.3 or 0.4 part per million, I could scientifically and comfortably agree with that.

Let me extend my answer a bit. I think the issue that has come up over and over again today has really been one of what really constitutes an adverse health effect. I think it is important that those of us that have watched this area have quibbled about this, but I think in general, we would agree with the determination that was made a year or so ago by the Scientific Assembly for the Environmental and Occupational Health Group of the American Thoracic Society.

In struggling with this, they concluded that there were really four or five reasons to determine that an adverse health effect had occurred, and they cautioned in their publications that one should not misinterpret statistical effects or adverse health effects. They went on to describe that a medically significant physiological effect that was considered adverse had to satisfy one of four conditions on the extreme end of the spectrum, and, of course, was something that resulted in permanent respiratory distress or episodic or respiratory illness or something that would be decapacitate.

That is outside of the bounds of what we are discussing today. On the extreme conservative side of their observation, they determined an adverse health effect could be something that would be an interference with normal activity of the daily life of the affected person.

Within the jurisdictions that you are describing where nonattainments occur, I think that again, if it is seen that pollutants are at or considerably above what the standards are scientifically, we would agree that activities of normal daily life could be impaired, even though we might have some quarrel about whether or not those ultimately in chronic terms were important.

Senator **Mitchell**. My time is up, so I am going to ask Mr. Schonbrun and Dr. Goldstein to wait until my next round in which I will begin by asking you to respond to that.

Senator Baucus.

Senator **Baucus**. Is there agreement as to what the definition is as to what constitutes adverse health effects within an adequate margin of safety? Are you all in agreement of what that is? Do you all know what that is?

Dr. **Goldstein**. Absolutely not, sir. There is a very wide margin of disagreement on that. I think you have heard it expressed here today. I think Dr. Green and other members of the panel disagree with that.

Senator **Baucus**. Don't you think we ought to agree with what that definition is?

Dr. **Goldstein**. No, sir. It is very difficult. Perhaps I can give an example. You can show in the kind of controlled exposure changes that Dr. McDonnell and Dr. Horstman work in, you can show that individuals at a specific level of——

Senator **Baucus**. I understand. Different people are different.

Dr. **Goldstein**. No, no, that is not what I mean. There could be a very small narrowing of the airway. They can pick this up as being a 5 percent narrowing of that airway. If you go from a warm room to a cold room, you can get a 10 percent narrowing of the airway. One can argue, however, that asthmatics and chronic bronchitics have problems. Therefore, 5 percent is important or there is an argument that it is not important.

Senator BAUCUS. What you are getting at is all the different variables that determine a person's medical condition. That is what you are getting at. I am still a bit perplexed that there is not an agreed-upon standard.

Dr. HORSTMAN. If I could offer this article "Guidelines as to What Constitutes an Adverse Respiratory Health Effect with Special Reference to Epidemiologic Studies of Air Pollution," is from the American Review of Respiratory Diseases, the American Thoracic Society's publication. I was involved in the review process of this particular article and I did not agree with its ultimate findings. I know many other reviewers who also did not.

There is no agreement on what constitutes an adverse health effect. As a matter of fact, this article was written from the point of view of epidemiological studies looking for chronic effects. We work primarily in the acute effects area, and we try to extrapolate or interpolate what might be related to chronic effects as a result of these acute effects as well as the importance of the acute effects, in and of themselves. We believe that the acute effects we observed are clinically significant.

We do not agree with these particular guidelines. If you get ten of us together, you will probably get ten opinions ranging from very conservative to very liberal in terms of how we interpret this issue (adverse health effects). I think you have heard indications of most of our individual interpretations today.

Senator BAUCUS. You all said you felt that 0.12 as the present standard is okay based upon present knowledge. You say 0.12 is okay. I would like each of you now to go down the table and tell me at what level is it not okay: 0.13, 0.19, 0.2, where? Just your gut guess. Point 12 you said is okay. What higher level is no longer okay? If you can tell me 0.12 is okay, you can tell me precisely what level it is not okay.

Dr. BOREK. I said that 0.12 might be okay.

Senator BAUCUS. I am sorry?

Dr. BOREK. I said it might be okay with the information that we currently have. I think more information is coming in all the time and the more you lower the levels, the more safety you have.

Senator BAUCUS. Can you answer my question? If you can tell me 0.12 is okay, I want you to tell me at what level it is not okay, precisely.

Dr. BOREK. I can't tell you.

Senator BAUCUS. How can you say that one is okay and one is not?

Dr. BOREK. I said we do not know if it is okay in terms of the information that we have. You cannot say this.

Senator BAUCUS. You don't know?

Dr. BOREK. We don't know.

Senator BAUCUS. Dr. Boushey?

Dr. BOUSHEY. I am really no more eager to give a specific number but I will try.

Senator BAUCUS. I didn't think you would be.

Dr. **Boushey**. Given the margin of safety?

Senator **Baucus**. Given what you interpret. You are a doctor; what do you think?

Dr. **Boushey**. Okay. If I were living in a part of town where the level of ozone was .15 ppm on more than 2 days a year——

Senator **Baucus**. We are talking about the standard.

Dr. **Boushey**. I understand—and I thought the community was taking steps to bring it down, I would stay there. If it was greater than 0.20, and I had my family, I would look for a home in a less polluted area.

Senator **Baucus**. But as far as the EPA standard is concerned, 0.12 is okay based upon the current knowledge?

Dr. **Boushey**. Within the current margin of safety.

Senator **Baucus**. What about 0.13.

Dr. **Boushey**. I tried to answer that. At 0.15 part per million, I would be comfortable. At 0.20 part per million, I would try to move away.

Senator **Baucus**. I am sorry; you did answer. Dr. Green?

Dr. **Green**. In about 10 days, we are going to be presenting some data at the American Thoracic Society where it looks as if we found some effects that are clinically, if not significant, at least repeatable at 0.4 part per million in heavily exercising individuals including asthmatics and normal subjects where we do begin to see that level not lower, effects that are repeatable and, although we cannot say.

Senator **Baucus**. So you are guessing maybe up to 0.4?

Dr. **Green**. At around 0.3 to 0.4 is probably the threshold. I might also say that that appears to be at the same level with animal studies; chronic effects where animals are exposed to 0.3 to 0.4 for a year have irreversible effects.

Senator **Baucus**. Okay. My time is running out quickly, Dr. McDonnell?

Dr. **McDonnell**. I will say I would be uncomfortable for people with the standard being set at 0.15. I think you are going to start to get a significant number of people that are going to start having significant acute changes at 0.15 parts per million. In a range from 0.12 to 0.15, again, you are going to start beginning to have a few people. So I think that is an area where there are a lot of changes.

Senator **Baucus**. Okay.

Dr. **Horstman**. I think anything in excess of .12 ppm. I know that is an implratic statement, but I feel that the 0.12 per million standard is very appropriate. I would also like just to back up a moment to one of Senator Baucus' previous question and say that my apparent lack of concern about margin of safety is also tempered by the fact that I see additional studies coming down the line, and see us dealing with these issues with actual data to guide us in two or three years.

Dr. **Goldstein**. Sir, first of all, I think 0.12 for one hour is the appropriate standard. Let me see say as Assistant Administrator at EPA I always gave a range of numbers and a careful description of what the adverse health effect issue was about for the administrator to set the standard. If I were the administrator, I would be comfortable at 0.12.

Senator **Baucus**. Okay.

Mr. SCHONBRUN. Senator, I am not sure I have much to add, since I am not a personal investigator in this area. I look at what the reports are that are coming in. I think the 0.12 seems convincing to me as I read it, but that is not based on my own scientific work.

Senator BAUCUS. Thank you.

Senator MITCHELL. Senator Chafee has entered. He is the former chairman of this Subcommittee, an author of many of the laws that protect the health of our people and our environment.

Senator Chafee?

Senator CHAFEE. Thank you, Mr. Chairman. I am sorry I couldn't have been here any earlier. I am very interested in this, because what these folks are saying is somewhat of a departure from what our general belief had been. So it certainly merits careful review.

I was most interested in Senator Baucus' line of questioning. I had one somewhat like that.

Let me just ask you this: In your testimony, you talk about heavy exercise. I am not sure I know what heavy exercise is. Is heavy exercise a child playing soccer, or is heavy exercise somebody running a marathon?

Dr. MCDONNELL. In the study that I reported on, heavy exercise was really at the extreme of what somebody doing normal activities outside would experience. This is activity that people performed every 15 minutes, that is 15 minutes of exercise, 15 minutes of rest for 2 hours, because an individual probably couldn't maintain an hour's worth of this level of exercise continuously. This is at the extreme. This level Dr. Horstman is talking about is at much more moderate levels of exercise. That is why I say the studies we are reporting on are really at the worst-case level.

Dr. HORSTMAN. I would like to say, I think heavy exercise is at the level of a child playing soccer for an hour.

Senator CHAFEE. After hearing Dr. McDonnell's description, I would say it didn't cover a child playing soccer.

Dr. HORSTMAN. I think it does. If you think about soccer, I used to play, it is a lot of running and stopping and running again. It is an interrupted exercise pattern, similar to what we did in our study, we did 15 minutes on and 15 minutes off exercise. Kids who play soccer hustle They run hard, and occasionally, they stop and do some guarding, and then they run hard again. I think that the average heart rate in our study was 160 beats per minute.

Kids playing an hour or two of soccer probably achieve the same total exercise. On the other hand, marathoners certainly work a great deal harder than this.

Senator CHAFEE. Is there any difference from that description from any of the others? I see a lot of knowledgeable soccer players in the audience shaking their heads, so it is good testimony. Thank you.

Thank you very much, Mr. Chairman. I appreciate your doing this.

Senator MITCHELL. Thank you, Senator Chafee.

To go to the next round of questions, we received a written statement from Dr. Robert F. Phalen of the University of California at Irvine, College of Medicine. (See p. —.) In his statement, and to some extent in her statement today, both Dr. Phalen and Dr. Borek raised questions about the synergistic effects of ozone and other pollutants, and the discussion now has been just about the effect of ozone.

First, are any of you aware of any research that has been done that demonstrates that there are no synergistic effects between ozone and other pollutants?

Dr. **Goldstein**. As part of the U.S.-U.S.S.R. exchange program many years ago, when we were still doing those things, we did some studies with the Soviets. We were able to show that the interaction between ozone and nitrogen oxide ranged from synergistic to protective depending on the range.

There are lot of studies. There was a study in January which showed ozone exposure actually decreased the incidence of cancer-causing agents, depending upon when it was given and, in particular, sequence. It is a very complex interaction between ozone and other agents, and in some cases, there is not only no synergism; that there is actually protection.

Dr. **Horstman**. For substances that are also oxidants, one might think of additive effects, especially if you get a big ozone effect. NO_2 might be additive. There are studies that show that PAN is at least additive with ozone. I don't know of any that show synergism.

Senator **Mitchell**. Dr. Borek?

Dr. **Borek**. The study that came out in January showing that ozone decreased the number of cells, if we are referring, if this the the same study Dr. Goldstein was referring to, it showed that ozone decreased synergism, but then the same study showed that ozone should induce tumors by itself.

So that I think one has to be very careful when one says that ozone does not interact with other agents.

Senator **Mitchell**. You believe the possibility exists, right?

Dr. **Borek**. Yes. I think you always have to take that into account. Because it may not be a dramatic effect, but it can introduce genetic damages which could be amplified by other agents.

Senator **Mitchell**. Dr. Boushey?

Dr. **Boushey**. There have been some studies that have looked for interactions as between ozone and sulphur dioxide's acute effects on people, and they have not demonstrated synergism. This brings up something I wanted to say in response to Senator Baucus' question about the need for research.

In a sense, we have been doing up to now resembles what alchemists used to do. There are so many different pollutants in the atmosphere that we would have to go through an almost endless number of studies of different combinations to determine whether they interacted synergistically to cause harmful effects. Where research is needed is on the mechanisms by which these agents act, to develop a sort of periodic table of how inhaled materials affect the respiratory system. With such information, we could logically predict which agents might interact, and therefore, design rationale experiments on interaction.

So that, in my mind, is where the research is needed, on the fundamental mechanism by which air pollutants act. This would help us predict interactions and long-term effects.

Senator **Mitchell**. Thank you.

Does any other panelist wish to comment?

Dr. **Green**. We did some studies years ago that looked at the amount of DNA replicating from cells in rats at various exposure levels to ozone, and we found that there was an initial response that began about 24 hours after continuous exposure at a level which is two times the current standard, at about 0.25.

We were not able to see a response in the DNA proliferation below that level, and we found that with a cessation of the ozone exposure after 15 days, the responsiveness of the DNA stopped.

Senator **Mitchell**. Dr. Horstman, let me ask you a separate question. You talked earlier about results in two or three years. I don't know if you or Dr. McDonnell used that.

Dr. **Horstman**. I did.

Senator **Mitchell**. Do you have any preliminary results from inquiry into the chronic effects at 0.08 parts per million?

Dr. **Horstman**. First of all, we are not looking at chronic effects at this time in the experiments.

Senator **Mitchell**. You are not?

Dr. **Horstman**. We are not.

Senator **Mitchell**. You are not.

Dr. **Horstman**. Prolonged in exposure effects, yes. No, we do not have any preliminary results.

In the first study we decided to look at the data after completion of ten subjects. We did look at the data of ten subjects and saw such large living functions changes that we went on immediately to a study of the concentration response relationship.

We are not planning to look at that particular data until we have ten or 15 subjects completed. We have not completed that amount. You pay something statistically if you do preliminary analyses of your data. Your significance levels change.

Senator **Mitchell**. When do you expect some results?

Dr. **Horstman**. Most of our subjects are students, and finding a day a week for 4 weeks available for them is difficult. We have completed nine subjects. We hope within the next four to six months to have at least another five or six completed.

Senator **Mitchell**. Yes. Since my time is nearly up, Senator Chafee?

Senator **Chafee**. Dr. Green, I would like to ask you a question. On page 2 of your written statement, you state that,

> It is inappropriate to base health effects judgments solely on statistically significant events that lack corresponding clinical significance.

Would you describe in a little more detail what you mean by "clinical significance"?

Dr. **Green**. There are two parts of that. First is that statistically significant results at the point of approximately one out of 20 of chance or, as we express it, a probability of 0.05 usually, in our judgment, frequently is a normal response of the normal population distribution.

So that is where we begin to have some problems with the significance. The second part of the question is that a significant health effect, in my judgment, clinically, would be one in which the activities of daily life are, in fact, impaired. I think that beyond that it is difficult for me to quarrel with the statement of the

American Thoracic Society which, as we have heard today, already has some problems with it in terms of general acceptance.

I am probably right in the middle path on that one.

Senator **Mitchell**. Does any other member of the panel wish to comment on that question and response?

[No response.]

Senator **Mitchell**. All right. I have a number of other questions which I will submit to you in writing. We will leave the record open for other Senators who were unable to attend the hearing to do so, as well.

Senator do you have anything further?

Senator **Chafee**. I would just like to ask one question, if I might, Mr. Chairman. Dr. Horstman, on page 6 of your testimony you refer to some studies currently in progress, is there any other research that is on-going that might shed more light on this?

I am sorry if I am repeating a question that was asked earlier, but as I understand, the testimony has indicated there is constantly further research. Is there any specific research that you folks are involved in that would shed more light on what we are interested in here and which research might be forthcoming fairly soon?

Dr. **Horstman**. There are the studies that were done with the children in summer camps in New York and New Jersey, which showed some responses. There are some problems with the studies in terms of the time of day measures were performed and documenting the exposure history for those particular children, but the magnitude of the changes in lung function that these children experienced are similar to those which we observed, and occurred during times when ozone concentrations were elevated for sustained periods similar to procedures we followed.

At present, those studies and the studies which we are conducting are the only ones that I know, but I feel quite sure that other laboratories will pick up on this particular issue and do other studies, perhaps at different concentrations with different exercises, that sort of thing. I think during the next 2 or 3 years, we will see some additional studies done in this area.

Senator **Chafee**. How about you, Dr. Goldstein? Have you done any?

Dr. **Goldstein**. Yes, sir. I have a special button on my word processor. I think everyone else here has it. You press it, and it prints out, "More research is needed."

Senator **Chafee**. We are very used to that in this committee.

Dr. **Goldstein**. I think we have a very strong data base on ozone. I think it really comes together well in terms of the animal studies, the epidemiological studies and in terms of the studies we have head from Dr. Horstman today. I think we need a real focus on the 8-hour exposure, the fact that there are people out there being exposed for eight hours a day, not just for one hour as we so glibly believed for so many years.

I think there is an existing data base that can tell us a lot about it. I think EPA should and are spending a lot of time looking at that point, saying, "Hey, instead of 1 hour, let's think of this from the point of view of 8 hours, 10 hours, 12 hours. What is it that we can do with the data base that we have now that can give us some information about whether or not we can set a standard about that particular time point, and what will that mean as we try to achieve attainment?"

It may well be that some of the strategies that won't work for 1 hour will work for 8 or 10 hours, and maybe the opposite. But we certainly have to look very closely at that.

Senator **Chafee**. What do you say to that, Dr. McDonnell?

Dr. **McDonnell**. In terms of other research?

Senator **Chafee**. Yes, and Dr. Goldstein urging you on to do research for longer periods.

Dr. **McDonnell**. I think it is absolutely necessary. Given the reports that Dr. Horstman has reported on saying the effects for 6 hours at 0.12 are much stronger than the effects for 1 hour, and because of the exposures that people are getting in a lot of cases are actually 6 to 8 hours, and even longer, I think it is critical that we know more about that. I think that consideration of a different type of standard or a new standard needs to be undergone when we get some of this new data.

Senator **Chafee**. Dr. Green?

Dr. **Green**. We have five series of experiments on ozone health effects that are planned to run at least until the beginning of calendar year 1989. In terms of the ozone issues that have been discussed today, they are all supported, I think.

The ones related to testing human subjects at the current standards or higher and then doing what was described earlier as a technique called bronchopulmonary lavage or looking at the cells produced, particularly after 8 to 10 hours of exposure and looking biochemically at what has happened to those cells that are the ones that we think are responding to ozone. We also have other programs that are looking at cell culture and other issues.

Senator **Chafee**. What do you think the 8-hour standard should be?

Dr. **Green**. I have no idea.

Senator **Chafee**. Does anybody want to venture a guess on that one?

[No response.]

Senator **Chafee**. Take a plunge, Dr. Goldstein.

Dr. **Goldstein**. I am afraid to do so. Let me tell you why. I think from a public health practitioner's point of view, it is so important that we focus on the right time frame. I am afraid whatever number I pick, I will affect some part of the process that is going to be involved in setting this 8-hour standard; that it would not be wise, since I published the original paper on it, for me to give a number. I hope you don't find offense at avoiding your question.

Dr. **Boushey**. It won't be higher than the current 1-hour standard.

Senator **Chafee**. Won't?

Dr. **Boushey**. That's correct, it won't be higher than the current 1-hour standard.

Senator **Chafee**. I assume that. Mr. Schonbrun, is there any light you can shed on this?

Mr. **Schonbrun**. No.

Senator **Chafee**. Thank you very much, Mr. Chairman.

Senator **Mitchell**. Thank you, Senator Chafee.

Thank you very much, Dr. McDonnell and Mr. Schonbrun. We look forward to working with you further on this problem. Thank you.

[Whereupon, at 11:25 a.m., the subcommittee was recessed, subject to the call of the chair.]

[Statements submitted for the record follow:]

TESTIMONY OF
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BEFORE THE
SUBCOMMITTEE ON ENVIRONMENTAL POLLUTION
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

March 31, 1987

Mister Chairman, Dr. Horstman and I appreciate the opportunity to testify before you on the subject of the health effects of ambient ozone. I will present an overview of the research on this subject and my colleague, Dr. Horstman, will discuss preliminary findings from a recent study of particular interest.

Ozone is a chemical oxidant and is a major component of photochemical smog. Large numbers of people are routinely exposed to ambient air containing levels of ozone at which effects upon the respiratory system have been demonstated. The major foci of ongoing research are to elucidate the acute and chronic effects of exposure from inhaled ozone, determine the conditions of exposure including ozone concentration which result in human health effects, and to identify any populations of individuals that may be at increased risk of developing health effects resulting from ozone exposure.

The lung is the organ that is most affected by ozone exposure. The major function of the lung is to transport oxygen from inhaled air into the bloodstream and carbon dioxide from the bloodstream into exhaled air. In order to do this, the lung is composed of 1) airways which divide into narrower and narrower segments and whose function is to conduct inhaled air to the deeper areas of the lung and 2) alveoli, millions of tiny air sacs at the end of the airways where the actual exchange of oxygen and carbon dioxide between the air and blood takes place. Both the airways and alveoli are lined with living epithelial cells of several types, each of which has a special function. In most areas of the lung, there is a thin layer of liquid covering the surface of the airways and alveoli.

When sufficient ozone is inhaled for one to two hours, several events occur. Ozone reacts chemically with compounds in the surface liquid producing a number of reactive compounds which, like ozone, can undergo oxidative reactions with other substances. Either ozone or these reactive substances or both then react chemically with the epithelial cells lining the lungs. This results in damage and death to some of these cells. These damaged cells release a number of biologically active substances into the airway and surrounding tissue. The lung then reacts to ozone, the other oxidative molecules, and/or the released mediators in ways that can interfere with respiratory function. Neural receptors in the airways and possibly the walls of the alveoli transmit signals to the central nervous system and the affected individual experiences cough, pain or discomfort upon deep inspiration, and shortness of breath. The individual becomes unable to inhale fully, changes to a pattern of rapid, shallow breathing, and may experience some narrowing of the airways. While these may be protective responses, their immediate effect is to cause discomfort and to limit performance. Within a short period of time following the beginning of exposure, the immune system begins to respond to the mediators released by the damaged cells. White blood cells (neutrophils followed by macrophages) infiltrate into the airways, alveoli, and the tissue surrounding the damaged cells in a process known as inflammation. These cells remove the damaged and dead epithelial cells and in the process also release a number of biologically active compounds some of which have the potential for further lung damage. Though not adequately studied in the case of ozone exposure, neutrophils are known to contain oxidative compounds toxic to cells, and under some circumstances macrophages can release substances which may enhance the development of pulmonary fibrosis, a chronic lung disease. Within an hour to several hours following cessation of exposure, the symptoms and lung function changes have begun returning toward preexposure levels. The inflammatory process takes from one to several days to resolve, and the process of replacing the damaged cells with healthy ones probably takes on the order of several days.

A simplistic analogy is the body's reaction to overexposure to the sun. The skin is lined with epithelial cells which are damaged or destroyed by ultraviolet light. These damaged cells release biological mediators and the body responds quickly with with pain and redness of the skin. These effects disappear in a day or so, and new cells replace the damaged cells over the course of several days as evidenced by the peeling process.

There are two major categories of effects which must be considered in assessing the health effects of ozone exposure. The first is the acute responses of the lung which include the symptoms and lung function changes mentioned. To the degree that these cause discomfort, limitation of performance, or in the extreme case, temporary disability or hospitalization, these effects are in and of themselves harmful. Of potentially more importance, but much more difficult to assess, is the question of whether recurrent exposure to ozone over a period of years may result in permanent damage to the lung, limiting performance in later life even in the absence of current ozone exposure. In both instances, one major question concerns the levels of ozone and the conditions of exposure necessary to result in effects of such magnitude as to be detrimental to human health and well-being. A second question of importance is whether some individuals are more likely to experience these effects than are others, and if so, who are these sensitive or responsive groups.

Study of the acute effects in man have been performed both in laboratory settings with controlled exposures and field settings where exposures are to ambient air containing ozone. The majority of laboratory studies have utilized one or two hour exposures. These studies were intended to mimic what were initially thought to be the prevalent ambient exposure patterns of a discrete peak of ozone followed by rapid disappearance. Recent evidence suggests that ozone exposure in many areas may consist of lower peaks which persist for longer time periods. The effects of these longer exposures will be addressed by Dr. Horstman. Most studies involve having subjects perform exercise during exposure because it has been well documented that acute ozone effects are increased by increasing the amount of air breathed per minute.

There is considerable agreement among laboratories about what acute effects ozone is capable of inducing. These include the symptoms cough, shortness of breath, and pain upon deep inspiration, a reduction in the ability to inhale maximally (decreased forced vital capacity (FVC)) which results in a reduced ability to exhale forcefully (decreased forced expiratory volume in one second (FEV1)), the onset of rapid, shallow breathing, mild airway narrowing, increased airway reactivity to a number of substances, a reduction of the ability of the epithelial cells to perform their barrier function, and the production of an inflammatory response in the lung. There have been suggestions from epidemiologic studies that ozone may increase the incidence of asthma attacks, and evidence from animal studies indicates that ozone exposure results in a higher incidence of infection following exposure of animals to infectious agents.

While the level of ozone producing measureable changes in symptoms and in lung function during one to two hour exposures with heavy exercise is agreed by most investigators to lie between 0.10 and 0.15 part per million (ppm), there is some difference of opinion as to the exact point. This difference of opinion is inherent in the process of attempting to determine a level at which no effects or effects smaller than the precision of the measurements themselves are observed.

In a recent study at the EPA Clinical Research Branch laboratory, 135 healthy, nonsmoking, 18-30 year old men were divided into six groups, with each group being exposed to one of the following ozone levels: 0.0, 0.12, 0.18, 0.24, 0.30, or 0.40 ppm. Exposures consisted of alternating 15 minute periods of rest and heavy treadmill exercise for two hours. The group exposed to clean air experienced a 1% decrease in FVC and a 1%

decrease in FEV1, no increase in cough, and small increases in shortness of breath and pain on deep inspiration. The group exposed to 0.12 ppm experienced on the average decreases in FVC (3%) and FEV1 (5%) and an increase in cough all of which were statistically significantly different from the air group. The groups exposed at the higher levels experienced larger changes in a concentration-response fashion.

We also observed, as have others, that there was a wide range in the magnitude of responses among individuals. To determine whether this was due to measurement variability or some transient condition of the individuals or whether this represented true differences in ozone responsiveness among individuals, we reexposed a number of these individuals under identical conditions a second time at intervals ranging from three weeks to one year. We observed that the differences in magnitude of effect among individuals were highly reproducible, i.e. the same individual is likely to respond in a similar pattern each time. We also selected several subjects with a range of responses and exposed each to up to six different concentrations. We observed that for the most part these differences were present at all concentrations though the range of differences increased with increasing concentration. We concluded that there was a spectrum of responsiveness to ozone in this otherwise fairly homogeneous group of young men. We have not yet identified characteristics which allow prediction of which individuals will be more or less responsive to ozone. It should be pointed out that this observed interindividual variability is common thoughout biological systems and is of such considerable interest in this case because ambient air often contains ozone concentrations at which these differences become obvious.

Included as an appendix are the frequency distributions for all six groups for changes in FEV1. While the percentages of individuals experiencing changes of a given magnitude must be interpreted with caution due to the relatively small sample sizes, these data provide an estimate of how the population of healthy young men would respond if exposed under similar conditions of heavy exercise. Briefly, the vast majority of men exposed to clean air had decrements in FEV1 between -2 and +2% with only one subject having a decrement between 5 and 10%. Following exposure to 0.12 ppm, eight subjects had decrements between 5 and 10%, two subjects had decrements between 10 and 15% and one subject had a decrement between 15 and 20%. At higher levels of ozone the range of responses was increased. Sixty-five per cent of subjects exposed to 0.12 ppm ozone experienced a mild cough, and a further 15% experienced a moderate cough.

In addition to variability among individuals, there has historically been concern that there may exist other subgroups of the general population that may be more sensitive or more susceptible to the effects of ozone than healthy nonsmoking males. In a number of ongoing and completed studies of women, blacks, children, and subjects with mild asthma, allergic rhinitis, and mild chronic obstructive lung disease, there has been no evidence that any one group is considerably more sensitive than another. Of the published data, children in laboratory studies have been observed to have lung function decrements of similar magnitude as adults after adjustment for size differences. One epidemiologic study, however, observed changes in lung function at levels as low as 0.06 ppm. It was speculated that this could be the result of exposures longer than one hour or the presence of other pollutants in the ambient air. Women have been observed to be more responsive than men in one study, but found to be no more responsive in another study. Patients with chronic obstructive lung disease cannot exercise nearly as heavily as healthy young adults; consequently, they have been studied at much lower exercise levels with no changes in lung function observed. Subjects with mild asthma have also been studied at lower exercise levels with no observed effects. Subjects with more severe asthma have not been studied nor have studies been carried out at higher exercise levels for the asthmatics, i.e. levels where effects have been observed in non-asthmatics. With the exception of the lack of data in severe asthmatics, most studies indicate that no population group is more responsive to ozone than is the group of healthy young men. The recent data on 6.75 hour exposures to be reported on by Dr. Horstman, however, indicates that longer exposures with lower exercise levels may also result in lung function decrements. Because patients with chronic obstructive lung disease and severe asthma already have reduced lung function, even small decrements due to prolonged ozone exposure at light exercise levels may be significant.

The question of whether recurrent exposure to ozone causes irreversible changes in lung structure or function in man is much less well studied than is the case for acute, reversible effects. The few long-term animal studies that have been performed at concentrations equal to or greater than 0.2 ppm suggest that recurrent exposure results in chronic inflammation in the smallest airways with some changes in the structure of these airways, and the presence of increased collagen in the lung which could be a precurser of pulmonary fibrosis, a chronic lung disease. While effects have been documented to persist for months following cessation of exposure, there has been no evidence of overwhelming lung disease. The possible role of ozone in the development and progression of chronic lung disease is currently under investigation in animal toxicological studies in our laboratories.

As mentioned earlier, further concern about the possibility of chronic effects in humans stems from what is known about the mechanisms of the acute effects. Specifically, repeated episodes of cell damage and repair with its attendant inflammation have the potential for causing irreversible damage in the lung. Returning to the analogy of the skin, a single sunburn is probably completely reversible. Recurrent exposure to the sun over many years, however, results in premature aging of the skin due to loss of elasticity. Whether a similar phenomemon occurs in the lung of humans upon repeated exposure to ozone is unknown. The few epidemiologic studies that have attempted to document the presence of increased disease or an increased rate of aging of the lung among recurrently exposed people have been plagued by methodological problems which make interpretation of the data difficult. In summary, animal studies and knowledge of the acute effects strongly suggest that recurrent exposure may result in chronic damage to the respiratory system; evidence in humans is lacking and information about what concentrations of ozone over what period of time are required to produce these effects in man is not available.

As noted earlier, the interpretation of the health significance of the measured acute responses of humans to ozone exposure takes place at two levels. The acute effects can in and of themselves interfere with normal activities by limiting performance and producing annoying symptoms. In extreme cases of high level ozone exposures, which are occasionally experienced under ambient conditions, responsive individuals may actually be unable to continue their normal activities due to severe symptoms and lung function decrements. The other question is whether even small changes in lung function and symptoms are indicators of underlying processes such as cellular damage and inflammation which, if experienced repeatedly, may result in chronic lung disease. Interpretation of data from laboratory exposures is further complicated by the recent understanding that ambient exposure to 0.12 ppm ozone for one hour may also include several hours of exposure to somewhat lower levels just prior to and after the peak. It is possible that this total exposure may result in larger acute responses than observed for a single one hour exposure in the laboratory. Continued exposures of this type over a long period of time may increase the probability of developing permanent lung damage.

Regarding the acute effects as health problems in and of themselves, it was noted that following a two hour exposure to 0.12 ppm ozone with intermittent heavy exercise, 10% of subjects experienced decrements in FEV1 between 10 and 15% with 5% of subjects experiencing a 15 to 20% decrement. Approximately 65% of subjects reported mild cough and 15% reported a moderate cough following exposure. In general, decrements in FEV1 are the result of inability to inspire deeply and are often associated with discomfort or coughing on attempting such a breath. In my opinion, individuals experiencing a 10% decrement will be aware of it during heavy exercise and may find that their performance is limited somewhat. Individuals experiencing a 15% decrement will be more aware and have further limitations while a 5% decrement is probably not noticeable acutely to the majority of individuals unless it is accompanied by cough. While a mild cough may be well tolerated by some individuals, the presence of a moderate cough indicates significant discomfort on the part of the exposed individual.

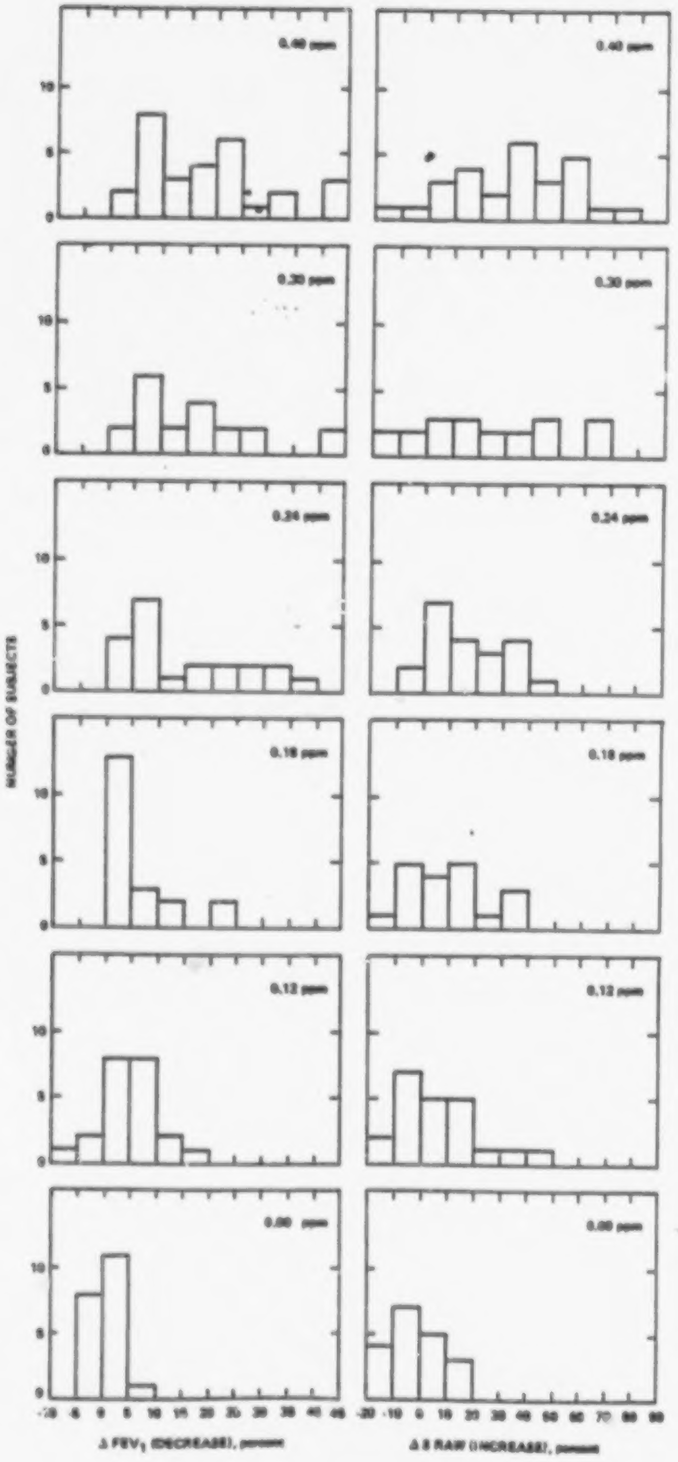
The question of how to interpret acute effects as indicators of the progression of irreversible lung damage is difficult. In my opinion, the changes seen at higher level animal exposures and the production of inflammation following higher level acute exposures are causes for concern. The likelihood that individuals are being exposed to low level peaks of longer duration than one to two hours and the possibility that these exposures may result in acute effects including inflammation of greater magnitude than those seen in two hour laboratory exposures is cause for even greater concern. Acute decrements in FEV1 of 10% and more are unlikely to be due to measurement error and represent the reaction of ozone in the airways. In my opinion, occasional decrements of this magnitude or even somewhat larger are completely reversible if these exposures occur in isolation. Frequent exposures resulting in decrements of this magnitude or less frequent ones superimposed on longer lasting lower levels of ozone, however, could potentially result in chronic changes in lung structure or function if they occur over a period of years. Whether frequent exposures to even lower levels of ozone with smaller decrements could result in chronic changes is unknown.

If individuals are exposed to 0.4 ppm ozone for two hours daily over a period of a week, the magnitude of the decrement is increased on the second day of exposure compared to the first day, and on subsequent days, the decrement decreases and disappears altogether by the fourth day in most instances. This phenomenon of attenuation has been historically referred to as "adaptation." Attenuation of the response at a low level of ozone does not decrease the response to a higher concentration, and in the absence of further exposures, the attenuation disappears gradually over the course of one to two weeks. Some have suggested that this reduction of the symptoms and lung function decrements with repeated exposures indicates that chronic effects of recurrent exposure are unlikely. There is evidence, however, that continuous or recurrent exposure of animals to ozone causes continued inflammation and progressive changes in lung structure. It is unlikely, in my opinion, that adaptation of these neurally mediated effects reflects a protective effect for the potentially more serious effects of recurrent ozone exposure. Furthermore, it is ill-advised to assume such in the absence of supporting evidence.

I would conclude the following regarding the potential health effects of ozone exposure.

1. Small mean changes in lung function and symptoms occur in heavily exercising, healthy individuals exposed to 0.12 ppm for two hours.
2. Differences in the responsiveness to ozone exist, with some individuals experiencing modest symptoms and lung function changes when exposed under the above conditions. The determinants or predictors of these differences are not known.
3. There are no known other population groups that are more sensitive or responsive to ozone exposure than are healthy young men.
4. There is evidence that longer exposures to 0.12 ppm at lighter exercise levels produce larger acute effects. Similar exposures at even lower levels have not been completed.
5. The hypotheses that ozone exposure results in increased frequency of asthmatic attacks or increased incidence of respiratory infections have not been adequately tested in man.

6. The long term consequences of recurrent short duration exposures or prolonged exposures are not known in man. However, based upon data from animal studies and what is known about the mechanisms of the acute response in humans, there is concern that such exposures have the potential to cause irreversible changes in lung structure or function.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NUMBER OF SUBJECTS
0
5
10
-10 -5 0 5 10 15 20 25 30 35 40 45
-20 -10 0 10 20 30 40 50 60 70 80 90
Δ FEV$_1$ (DECREASE), percent
Δ SRAW (INCREASE), percent

TESTIMONY OF
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BEFORE THE
SUBCOMMITTEE ON ENVIRONMENTAL POLLUTION
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

March 31, 1987

As Dr. McDonnell has just discussed, investigators in the EPA Clinical Research Branch had previously reported small decrements in lung function and the occurrence of cough following the performance of heavy intermittent exercise during two hour exposures to 0.12 ppm ozone. There is a question whether sufficient numbers of individuals actually perform heavy exercise under these ambient exposure conditions to warrant concern. However, we do know that for exposure at any ozone concentration, the severity of lung function decrements and respiratory symptoms experienced are related to both the intensity of the exercise performed (light, moderate, heavy) and to the duration of the exposure. Increasing exercise intensity requires the inhalation of greater volumes of air (increased ventilation) and during exposure the total volume of ozone inhaled increases in proportion to the increase in ventilation; extended exposure duration, of course, also results in the inhalation of a greater total volume of ozone. Thus, it can be hypothesized that if the exposure duration at 0.12 ppm ozone were extended, we would observe lung function decrements and symptoms would be experienced with the performance of moderate intensity exercise (less ventilation). Extended performance of moderate intensity exercise is analogous to moderate to heavy adult manual labor or children's or adolescent's play, a level of exercise experienced by substantial numbers of individuals.

To test this hypothesis, Drs. Lawrence Folinsbee, William McDonnell and I recently completed a study of the respiratory responses of normal individuals performing moderate exercise during prolonged exposure to 0.12 ppm ozone. The current National Ambient Air Quality Standard (NAAQS) for ozone is an hourly average concentration of 0.12 ppm. The preliminary findings from this study will follow and will also be presented by Dr. Folinsbee at the Annual Meeting of the American Thoracic Society in New Orleans, LA, in May of this year. A manuscript describing the findings is in preparation and will be submitted for peer review and subsequent journal publication.

Episodes in which ozone levels are at or near 0.12 ppm for several hours in succession occur in some U.S. cities as well as suburban and rural areas downwind of urban sources. Extended exposures to low concentrations of ozone with substantial amounts of moderate exercise had not been previously evaluated and our study was designed to investigate the effects of such exposures. Specifically, 10 nonsmoking males (18-35 years of age) were exposed once to clean air and once to 0.12 ppm ozone for 6.75 hours. For these exposures, we attempted to simulate the daily energy requirement and activity pattern of a typical adult engaged in moderate to severe manual labor or that of a child or adolescent engaged in very active play. The morning of exposure consisted of three 50 minute exercises, the first and second exercises were followed by a 10 minute rest while a 45 minute lunch break followed the third. The afternoon of exposure consisted of three 50 minute exercises, each followed by a 10 minute rest; a total of 5 hours of exercise was performed during each exposure. Exercise consisted of both pedaling a stationary bicycle and walking on a treadmill. For measurements obtained during all six exercises, ventilation averaged about 41 liters per minute, while heart rate averaged about 115 beats per minute in both clean air and ozone. These results indicate the level of effort (i.e. exercise) associated with these exposures was about 35% of each individual's maximal work capacity. This level of effort is within the range of exercise intensity normally associated with hard physical work or play performed regularly over an eight hour period.

Lung function and respiratory symptoms were evaluated before exposure and after each of the six exercises. During exposure to clean air, there were no functional changes nor did symptoms occur. During ozone exposure, indices of lung volume and airway flow demonstrated progressively larger decrements as the exposure progressed. Statistical tests indicated a significant overall linear trend for pulmonary decrements as a function of exposure time. By the end of the 6.75 hour exposure, lung function decrements were similar in magnitude to those previously observed for other subjects exposed to much higher ozone concentrations. For example, forced expiratory volume in one second (FEV1), a measurement which is influenced by changes of both lung volume and airway flow and which is most often reported in studies of ozone exposure, was decreased by 13.6% (0.59 liter). We had previously observed a 17% (0.76 liter) decline in FEV1 after two hour exposure to 0.40 ppm ozone with heavy intermittent exercise. As we and others have previously observed, there were also considerable differences in the ozone responsiveness of individual subjects. Of the ten subjects, five exhibited FEV1 decrements of less than 10%, including two who apparently exhibited no response. The remaining five experienced FEV1 decrements greater than 10%, including one subject whose FEV1 decrement was in excess of 40%.

We evaluated the respiratory symptoms of cough and substernal pain upon deep inspiration; these symptoms had been previously shown to result from ozone exposure. Differences among subjects were also observed for symptoms. Of the 10 subjects, two experienced no coughing throughout, two coughed while performing lung function tests, while six exhibited spontaneous coughing by the end of exposure. Two subjects experienced little pain upon deep inspiration, three rated the pain as mild, while five rated the pain as moderate or severe by the end of exposure. It should be noted that if a subject were to experience continuing multiple coughs or to rate pain upon deep inspiration above moderate (i.e., severe/intolerable), this would have warranted his discontinuing exposure. As previously observed by Dr. McDonnell, under ambient exposure conditions similar to those employed in our study, the more ozone-responsive individuals may be unable to continue their normal activities due to the severity of respiratory symptoms and lung function decrements.

Following exposures to both clean air and ozone, we also measured nonspecific airway reactivity (i.e., airway responsiveness to methacholine). Previous studies, most of which were conducted in Dr. Boushey's laboratory at the University of California in San Francisco, have demonstrated a strong relationship between ozone-induced increases in nonspecific airway reactivity and the occurrence of airway inflammation. As in the case of functional decrements and symptoms, airway inflammation (documented by analyses of bronchoalveolar lavage fluid or lung tissue biopsy) occurred only in some fraction of the individuals exposed to ozone. Those individuals who experienced ozone-induced airway inflammation also demonstrated increased nonspecific airway reactivity, while those whose airways were not inflamed did not. In our study, the average nonspecific airway reactivity following ozone exposure was more than double that following exposure to clean air. Again, differences among individual subjects were observed: no differences between exposure conditions were observed for three subjects, while reactivity following ozone exposure for four subjects was at least four times greater than that following clean air. These results have meaningful health implications to the extent that the increased nonspecific airway reactivity may be indicative of ozone-induced airway inflammation and, as has been suggested by Dr. McDonnell and others, the extent to which airway inflammation may be involved in permanent airway damage.

Presently, in the EPA Clinical Research Branch, we are conducting a concentration-response study employing our previously described 6.75 hour exposures with six periods of moderate exercise in 0.00 (clean air), 0.08, 0.10 and 0.12 ppm ozone. Results from this ongoing study will extend our knowledge of the effect levels for changes in lung functions, respiratory symptoms and nonspecific airway reactivity resulting from more prolonged exposures to relatively low ozone concentrations. Upon completion of this study, we plan to investigate other health end points, including indicators of airway inflammation and permeability, at the lowest effects level observed for increases in nonspecific airway reactivity.

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AMERICAN LUNG ASSOCIATION
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STATEMENT OF

HOMER BOUSHEY, M.D.

ON BEHALF OF

THE AMERICAN LUNG ASSOCIATION

TO THE

SUBCOMMITTEE ON ENVIRONMENTAL POLLUTION
SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

RE: HEALTH EFFECTS OF OZONE

MARCH 31, 1987

National Headquarters: 1740 Broadway, New York, N.Y. 10019-4374 • James A. Swomley, Managing Director

Mr. Chairman, members of the Committee, I am Dr. Homer Boushey, a specialist in pulmonary medicine and Associate Professor of Medicine at the University of California, San Francisco. I am presenting comments today on behalf of the American Lung Association.

The constituents of the photochemical oxidant group of pollutants are a complex mixture of chemicals formed in the air as a result of the action of sunlight on oxygen and on the hydrocarbons and nitorgen oxides emitted from mobile and stationary sources. Because ozone is the oxidant present in highest concentration and because other photochemical oxidants generally track with ozone, atmospheric levels of ozone are reported as an index of the severity of photochemical pollution. Typical one hour average concentrations of ozone range from 0.01 parts per million in rural areas to as high as 0.35 parts per million in large urban areas, of which the Los Angeles basin is the most notorious.

The reasons for concern over possible harmful effects of ozone on human health are numerous: ozone is a highly reactive compound and a potent oxidizing agent. It is poorly soluble, so the nose is ineffective in removing it from inspired air. At high concentrations it causes prompt and lethal pulmonary edema in rats, rabbits, and other laboratory animals.

The interest of this Committee is in the effects of the concentrations below those that cause severe and immediate disease. The questions are first, whether the current ambient air quality standard of 0.12 parts per million as a one hour average is sufficient to protect human health with a margin of safety and, second, whether there are adverse consequences of recurrent or persistent exposure to concentrations above this limit.

The results of many studies of the effects of acute exposure of human volunteer subjects are consistent. In subjects exposed at rest or while performing light exercise, 0.30 parts per million of ozone causes chest pain, a fall in vital capacity (the maximum amount of air that can be expelled), narrowing of the airways, an increase in sensitivity of the airways to inhaled irritants, and inflammation of the tracheobronchial tree. In subjects exposed while performing more vigorous exercise, these effects are seen at lower levels of ozone, at around 0.12 to 0.15 parts per million, perhaps because increased exercise levels require higher rates of ventilation and increased oral breathing. Thus, more ozone is delivered to the sensitive tissues of the lung periphery. This may be why performance at school track meets correlates negatively with ozone levels. It is certainly a reason for concern over possible effects on children, for they spend much of their time outdoors, exercising vigorously.

Many investigators have remarked on the variability of responsiveness to ozone among individuals, and this has been formally documented in a recent study done at the Environmental Protection Agency. For an as yet unknown reason, some perfectly healthy individuals have greater symptomatic and physiologic responses to low concentrations of ozone. These "responders" constitute between 5 and 20% of the healthy adults studied.

Studies of subjects whom one might predict to be very sensitive, such as patients with asthma or chronic bronchitis and emphusema, are reassuring, for they do not show them to be remarkably more sensitive than healthy people. Many of them have, of course, limited respiratory reserve, so they tolerate poorly any further loss of function.

These acute effects have been shown consistently. It is much more difficult to be sure of the effects of chronic or repeated exposure to ozone. The lungs of laboratory animals exposed repeatedly for many weeks or months show inflammatory, fibrotic changes in the terminal airways, where emphysema and chronic obstrucitve bronchitis are thought to begin. Epidemiologic studies of human populations are not so clear cut. It does appear, however, that in people with asthma the rates of attacks correlate with levels of ozone near the current standard. It also appears that prolonged residence in the more polluted regions of the Los Angeles basin is associated with more rapid deterioration in pulmonary function. The effects look something like accelerated aging of the lung. The longest prospective study I know of, however, is only in its 8th year and it is hard to know whether the more rapid deterioration in lung function predicts the development of symptomatic impairment.

An even more difficult question is the possible interaction between ozone and other agents, like cigarette smoke, respiratory viruses, and allergens in producing disease. Perfectly plausible rationales can be put forth for suggesting that such interactions are likely, and some of these theories are supported by studies of laboratory animals, but none has been proven in humans. It is these concerns that underlie, perhaps, the concept of the margin of safety. In dealing with a material to which millions of people are involuntarily exposed, it is prudent to set a standard that minimizes the risk of plausible even if unproven hazards.

In summary, Mr. Chairman, ozone has easily demonstrable acute and unpleasant effects in people performing heavy exercise while breathing concentrations at or just above the standard. Animal and epidemiologic studies suggest that long-term consequences result from repeated exposure to similar levels and further raise concerns over possible interactions of ozone with other agents in causing chronic disease. If there is concern about the current standard for ozone itself, the appropriate role for Congress in this regard is to review the standard setting process as defined in the Act to assure that the standard set by the Environmental Protection Agency meets the criteria established. Such a review would allow the exploration of the many factors impacting decision making including discovery of new research findings, the complexity of the findings on health effects of air pollution, gaps in the knowledge base and inadequate research funding and coordination to pursure them, and inadequate resources for the standard setting process itself.

What ever the standard is, Mr. Chairman, the question of attaining that standard is most important. The Environmental Protection Agency currently estimates that approximately 60 areas of the country will remain in nonattainment after the December 31, 1987 deadline. Of these 60 areas, the Agency predicts that at least 35 will experience ozone levels exceeding the current standard for 5 years or more, given current control efforts. This is a significant problem that must be addressed as expeditiously as possible. The American Lung Association urges Congress to review the nonattainment program and determine the improvements necessary to meet the standard in all regions of the country. The ALA and its medical section, the American Thoracic Society stand ready to assist you in resolving this complex problem.

Thank you for this opportunity to comment.

TESTIMONY OF:

CARMIA BOREK, Ph.D.

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ON HEALTH EFFECTS OF OZONE

BEFORE THE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

UNITED STATES SENATE

WASHINGTON, D.C.

March 31, 1987

CARMIA BOREK

Mr. Chairman, Members of the Committee,

I am Carmia Borek, Ph.D., Professor of Pathology at Columbia University in the Radiological Research Laboratory. I appreciate the opportunity to testify before you on the subject of health effects of ozone.

The identification of environmental pollutants with carcinogenic potential is of relevance to human health. Ozone, a reactive species of oxygen constitutes the largest atmospheric pollutant in industrial areas and is a health hazard to man (National Research Council, 1977). It is a key oxidant in smog and is formed by the action of sunlight on nitrogen oxides and hydrocarbons such as are emitted from automobiles. Furthermore ozone is used as a disinfectant and as a cosmetic treatment. It is produced by ultraviolet lamps. It is present at high altitudes and is encountered by passengers in planes flying above 30,000 feet.

Ozone oxidizes a variety of molecules to produce toxic free radical intermediates, some possessing carcinogenic potential. Work by us and others shows that free radicals (molecules with unpaired electrons that are very reactive) play an important role in carcinogenesis (Borek et al, 1985, 1986a). We have made a study to test if ozone is carcinogenic in mammalian cells. This included the effects of ozone in the absence and presence of ionizing radiation. Radiation itself is carcinogenic (Borek, 1985). The combined experiment was to test whether ozone and radiation are synergistic in their carcinogenic action.

Cell cultures lend themselves well to testing for potential carcinogens. Cells transformed in culture by carcinogens produce tumors in animals. This permits us to measure the effects of agents under circumstances that are not possible in clinical research. Such studies are useful for defining concentration-response relationships of single and combined agents over a wide range of experimental conditions. They are also useful for testing hypothesis, as a prelude to clinical investigations, and as an aid in the design of epidemiological studies.

In experiments designed to test the cancer causing ability of ozone, control animal cells were exposed to air and test cells were exposed to air containing 5 ppm of ozone for 5 minutes or ozone plus radiation (300 or 400 rad). An additional group of cells was exposed to radiation alone (Borek et al, 1986b).

We found that ozone causes cells to become cancerous. Control cells showed no change. We also found that ozone enhances the cancer causing effect of radiation in a synergistic fashion. Our results are shown in Tables I and II (Borek et al, 1986b).

The treatment of cells with ozone resulted in chemical changes in the cells. We found enhanced levels of lipid peroxidation products in the ozone exposed cells as compared to controls. These products are free radical intermediates which damage DNA and can be carcinogenic. Our results strongly suggest that free radical reactions play a part in the cancer causing action of ozone.

In Summary:

Our findings indicate that 5 ppm of ozone can convert sensitive animal cells to malignancy. Our work also shows that ozone enhances the carcinogenic effects of radiation. Additional research is required to investigate the potentials of ozone as a cancer causing agent.

It is important to study the effects of ozone at lower doses and to test its carcinogenic effect in human cells.

It is important to investigate if the cancer causing effect of ozone can be prevented or reversed.

It is important to find out if ozone enhances the carcinogenic effects of other environmental pollutants.

Our work serves to alert rather than alarm. While it is impossible to eliminate all sources of pollution it is important to avoid excess exposure to ozone. Previous concern was focussed on the immediate toxic effects of ozone. What I believe is at issue is its delayed genetic effects as a contributing factor to cancer in man.

I thank you Senator Mitchell and the Committee for having heard my comments. I hope they have been helpful.

Carmia Borek

Carmia Borek
Professor of Pathology
in Radiation Oncology

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Table I. Transformation of hamster cells by O_3 and γ-rays

Treatment	Total cells at risk	SF^a (PE %)	No. of transformed colonies	$TF^b \times 10^3$	95% confidences intervals^c $\times 10^3$
Control	5820	1.00(6.7)	0	0	≤ 0.51
O_3 (5 ppm for 5 min)	6206	0.89	11	1.77	[1.0, 3.2]
γ-rays (300 rad)	6606	0.77	45	6.81	[5.1, 9.1]
γ-rays + O_3	7040	0.74	105	14.91	[12.3, 18.0]
γ-rays + O_3 (independent action)				8.6	[6.7, 11.4]

Table II. Transformation of mouse cells by O_3 and γ-rays

Treatment	SF^a (PE %)	Total cells at risk	No. of Transformed colonies	$TF^b \times 10^4$	95% confidence intervals $\times 10^4$
Control	1.00(26)	113192	0	0	0.3
O_3 (5ppm for 5 min)	0.92	118818	16	1.35	[0.8, 2.2]
γ-rays (400 rad)	0.53	133482	88	6.59	[5.3, 8.1]
γ-rays + O_3	0.49	127585	182	14.26	[12.4, 16.5]
γ-rays + O_3 (independent action)				7.94	[6.8, 9.9]

[a] SF = survival fraction (plating efficiency).

[b] TF = transformation frequency (transformants per surviving cell).

[c] The confidence intervals were calculated as follows: assuming that the number of transformants (x) in an experiment i a random variable with a Poisson distribution, $p(x\ \lambda)$, the expected numbers of transformants, λ, can be estimated from:

$$g(\lambda \mid x)\ d\lambda = \exp(-\lambda)\lambda^x/x\ d\lambda$$

where g is the conditional probability distribution of λ given an observation x. The estimator, $\lambda_1 + \lambda_2$ corresponding to the sum of two Poisson-distributed variables, x_1 and x_2. is similarly characterized by:

$$f(\lambda_1 + \lambda_2 \mid x_1 + x_2) = \exp(-\lambda_1 - \lambda_2)\lambda^{x_1 + x_2 + 1}/(x_1 + x_2 + 1)!$$

Both distributions, g and f, are gamma functions and confidence intervals can be readily calculated in the usual way (modified from Borek et al, 1986b).

Statement of
General Motors Corporation

to the

Senate Environment and Public Works

Subcommittee on Environmental Protection

on the

Health Effects of Ozone and Carbon Monoxide

Presented by

Christopher C. Green, M.D., Ph.D

March 31, 1987

Washington, D. C.

Mr. Chairman, I am Christopher C. Green, Head of the Biomedical Science Department at the General Motors Research Laboratories. I appreciate the opportunity to present to the Subcommittee General Motors views on the potential health effects of ozone and carbon monoxide. I'd like to emphasize that I am here today more as a scientist rather than a representative of the auto industry. I am hopeful I can make a contribution to the Committee's better understanding of the scientific evidence surrounding this important but complex issue.

Ozone

With regard to ozone health effects, I'd like to begin by making three observations. First, we applaud EPA research programs under way in an effort to gain a better understanding of the ozone health effects issue. We have similar kinds of research ongoing in our own laboratories and we look forward to working with the Agency where we can.

Second, a better understanding of existing data is needed with regard to potential health effects to avoid the pitfalls of extrapolation from high-dose to low-dose responses. Data from animal studies has shown conclusively that ozone inhaled in high concentrations is toxic. However, the data from high dose acute studies simply cannot be used to predict effects of ambient concentrations at the lower doses to which human populations are exposed. This is true especially for areas of non-attainment and provides an important rationale for research that we are aggressively pursuing in our own laboratories.

Third, even if we are able to measure a change in response at low level exposures, we must be careful in our interpretation of such a change so that we do not rely on statistically significant events that are without corresponding clinical significance. In our view, it is inappropriate to base health effects judgments solely on statistically significant events that lack corresponding clinical significance. We accept and support heartily the views of the Scientific Assembly for Environmental and Occupational Health of the American Thoracic Society in their definition of what constitutes "adverse respiratory health effects." (See Attachment 1, Am. Rev. Respir. Dis. 1986; 131:666-668)*

Based on our research and review of existing evidence, including our review of EPA's criteria document on ozone, we do not believe that clinically significant health effects are produced by exposures to ozone concentrations at or near the standard. The current ozone standard provides a sufficient margin of safety so that most people living in ozone non-attainment areas are rarely, if ever, exposed to ozone levels that could cause adverse health effects.

Small deviations in the measurements of pulmonary mechanics of individuals during unusually heavy exercise have been produced with exposures to low ozone concentration, but the reasons for these effects are unclear. As the EPA criteria document points out, there is a growing body of experimental evidence that suggests that such symptoms represent nothing more than the involvement of vagal sensory receptors in modulating the acute responsiveness to ozone. That is to say, such responses may simply be a reaction to ozone exposure by the body's nervous system, much like the pupil of the eye reacts to sudden exposure to bright sunlight. If this is correct, it is difficult to accept that such symptoms constitute an adverse health effect.

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*Retained in committee files.

We understand that EPA has recently completed research that simulates the situation of a worker performing heavy manual labor outdoors. The exposures were of low level concentrations of ozone at .12 ppm over a continuous seven-hour period. The data indicate changes in lung function that are statistically significant. In view of the possible transitory character of these changes, it is not clear whether such data would indicate an adverse health effect. We look forward to examining the EPA data and will provide EPA with our comments.

The Clean Air Act mandates that sensitive subpopulations at greater risk must be identified and protected. Research efforts, our own included, have focused on individuals having pre-existing disease, such as those persons who suffer from asthma. We agree with the EPA criteria document's findings that, based upon currently available evidence, individuals with pre-existing disease respond to ozone exposure in about the same way as do normal, healthy subjects. Indeed, patients with chronic obstructive lung disease and/or asthma have not shown increased responsiveness to ozone in controlled human exposures to low ambient levels of ozone. Due to the many confounding factors that come into play, there is no reliable data from epidemiological studies that asthmatics are more responsive in their symptoms to ambient air exposures than healthy individuals.

Continued evaluation is, of course, important. In this regard, our biomedical research department is currently conducting a research program that looks at clinical responses to high ozone concentrations by comparing pulmonary testing of healthy people under conditions of moderate to heavy physical exercise to individuals that have bronchial asthma under the same exercise conditions. We look forward to reporting our findings at the meetings of the American Thoracic Society in New Orleans on May 10.

We also question claims of adverse health effects in children exposed to ozone. For instance, published research data from the EPA laboratory in North Carolina published by Dr. McDonnell in 1985, in which vigorously exercising children were exposed to low concentrations of ozone, show that the children are not more sensitive to ozone than adults. Indeed, in contrast to the results seen in adults, the children did not even develop symptoms of cough during exposure. Similar observations have been reported by other laboratories.

Also with regard to purported adverse health effects in children exposed to ozone, the significance of the so-called summer camp studies needs to be further discussed. First, the epidemiological observations in these studies have not always produced consistent results. Moreover, the alleged trends in pulmonary function tests were not significant enough to document ozone-induced injury or an adverse health effect in the respiratory system. In our judgment, citing statistical differences in such subtle changes of physiological functions without noting the clinical significance, can create a false impression regarding the importance of the findings. For example, comparable changes and symptoms are produced by many other factors in our day-to-day activities. These, like the symptoms from low level ambient exposures, rapidly disappear when the exposure is discontinued.

The upcoming conference of the Air Pollution Control Association (APCA) in June will systematically analyze the significance of the changes observed in the summer camp studies. We are looking forward to such analysis to help improve our understanding of these studies. (See Attachment 2, GM's June 25, 1986, comments on EPA's "Review of the National Ambient Air Quality Standards for Ozone: Preliminary Assessment of Scientific and Technical Information."). *

Similarly, we do not believe that persuasive data exist that would identify any specific population group to be especially

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*Retained in committee files.

sensitive to ozone nor do we believe that significant differences have been reported for age, sex or other factors in influencing the response to ozone. (See Attachment 3, GM's February 18, 1986, comments on the second external review draft of "Air Quality Criteria for Ozone and Other Photochemical Oxides.").*

Finally, with regard to concerns about potential long-term effects, our judgment is that existing evidence does not support claims that mechanisms of injury observed in animals exposed to high ozone concentrations -- above .5 ppm -- are indicative of the kinds of effects that might be found if the animals were exposed to the lower ambient concentrations at which most human exposure occurs. In fact, the most recent evidence shows that contrary to previous predictions, long-term exposures of laboratory animals to low concentrations of ambient ozone do not result in any significant fibrotic changes in the lung. (See Attachment 4, Wright, E. S., Kehrer, J. P., White, D. M. and Smiler, K. L., "Effects of Chronic Exposure to Ozone on Callagen Metabolism in Rat Lungs", The Toxicologist, vol. 7: 744: February 1987; and James P. Kehrer, "Analysis of Lung Callagen Content and Synthesis Following Chronic Exposure of Rats to Ozone," Contract Report, General Motors Corporation, November 1, 1986).*

These studies used low concentrations of .12 ppm ozone and reported that contrary to predictions that had been extrapolated from much shorter experiments with higher concentrations, the animals tolerated practically a lifetime of exposure without any significant harmful effects on lung collagen content or synthesis.

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*Retained in committee files.

Other long-term studies conducted in our laboratories have also shown that unless the day-to-day exposures to ozone are higher than .5 ppm, the inhalation produces minimal changes in lung structure and function and even these minimal changes rapidly disappear when the exposure ceases. (See Attachment 5, Kenneth B. Gross and Harold J. White, "Pulmonary Functional Morphological Changes Induced by a Four Week Exposure to 0.7 ppm Ozone Followed by a Nine Week Recovery Period," J. Tox. and Environ. Health 17:143-157, 1986; and "Functional and Pathological Consequences of a 52 Week Exposure to 0.5 ppm Ozone Followed by a Clean Air Recovery Period," accepted for publication, Lung , 1987.)*

These experiments raise serious questions regarding interpretations of other animal studies as being indicative of permanent lung injury due to low concentrations of ozone.

Carbon Monoxide

Turning to our views on carbon monoxide, an even more compelling case can be made that the health risks faced by persons living in nonattainment areas are less significant than previously thought. Indeed, there has been increasing evidence in recent years that the current 9 ppm standard may be considerably more stringent than needed to protect public health.

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*Retained in committee files.

Controversy over health effects of exposure to various levels of carbon monoxide first revolved around data from the laboratories of Beard and Wertheim which claimed to identify neurotoxicity after inhalation of low levels of CO. This study has long been discredited. The controversy today centers on data from the laboratories of Aronow which relate CO levels to angina attacks. These studies claim that small amounts of carboxyhemoglobin (COHb) in the blood of angina patients causes a decrease in their ability to withstand extended exercise without experiencing angina discomfort. The most controversial claim by Dr. Aronow was that levels of COHb as low as 2% can cause an average of 10% reduction in exercise tolerance in angina patients.

Our scientists have played an active role over the years in attempting to analyze such findings and to place them in proper perspective. Our reviews indicate that studies of CO effects so far presented in peer-reviewed literature are deficient on several grounds. (See Attachment 6, Jaroslav J. Vostal, M.D., "The Lowest Adverse Health Effect Level of Carbon Monoxide: Current Status of the Data Base," Research Publication, General Motors Corporation, September 30, 1983). *

We are not alone in our assessment. In May 1983 a panel of independent scientists was appointed by EPA to review Dr. Aronow's work on the effects of carbon monoxide in angina pectoris patients. The panel recommended that EPA not rely on the data in the standard setting process. If these data are disregarded,

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*Retained in committee files.

nearly all available scientific evidence indicates that there is no clinically significant adverse health effect from low level carbon monoxide exposures with regard to the general population, including potentially susceptible groups, unless the mean levels of (COHb) exceed the threshold level of 3.5 to 4%. In this regard, it is important to note that analytical models of carbon monoxide uptake indicate that no significant fraction of the population will reach the threshold level of 3.5 to 4% of COHb even if the existing ambient air quality standard were to be considerably relaxed.

The scientific community has been very much concerned about the validity of experimental data upon which the current standard is based. As a result, the Health Effects Institute (HEI) has begun, at the request of EPA, a verification study on the effects of CO. The HEI is a blue-ribbon panel of scientists, jointly funded by the auto industry and EPA. This multi-million dollar HEI project is expected to provide a final assessment later this year -- well before EPA is scheduled to reevaluate its decision on the CO standard in February 1988.

Summary

The scientific community as well as General Motors shares the Subcommittee's interest and concern with regard to protection of public health and nonattainment of the National Ambient Air Quality Standards for ozone and carbon monoxide. However, we believe that the consequences of our nation's failure to meet the NAAQS for these pollutants, with respect to health effects, have been the subject of considerable overstatements. The current ozone standard provides a sufficient margin of safety so that most people in non-attainment areas will rarely, if ever, be exposed to the high levels of ozone or carbon monoxide that are known to cause health effects.

We recognize that the data upon which the scientific community relies could be subject to differing interpretations. In many respects it is difficult not to be overly conservative in our efforts to protect public health. Indeed, we appreciate that judgments must be made with regard to health effects, even though our understanding of the detailed mechanisms of the potential effects of a given pollutant is inadequate. The state of our knowledge at this time is not definitive or satisfactory to make precise determinations. More time and research is needed. The EPA has a regulatory and criteria review process that is currently active in assessing health effects of exposure to various levels of ozone and CO. We congratulate EPA in its research efforts to-date and look forward to working with the Agency in its review of these most important issues.

Thank you.

Congressional Testimony
Subcommittee on Environmental Protection
Senate Committee on Environment and Public Works

March 31, 1987

Michael K. Schonbrun
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and
Chairman
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Mr. Chairman, I want to thank you and the Committee for the opportunity to appear before you today. My testimony will concern itself with the health effects of air pollution, particularly carbon monoxide in Denver, Colorado.

My name is Michael Schonbrun. For the last five years I have been president and chief executive officer of the National Jewish Center for Immunology and Respiratory Medicine, the only research medical center in the United States that focuses all of its energies on lung disease and immune-system disorders. Patients - both adult and pediatric - come to its facilities in Denver from all 50 states and many foreign countries. Most are sent by physicians specializing in lung disease and allergy. This year, National Jewish will receive nearly $12 million in research support from the National Institutes of Health. Over 300 of the nation's outstanding pulmonologists and allergists have trained at National Jewish and are in clinical and academic settings throughout the U.S. The American Review of Respiratory Disease, the world's leading scholarly journal in lung disorders, is edited at National Jewish. It is no small irony that a research medical center specializing in lung disease is located in one of America's most polluted cities. It does, however, make for a very interesting "real life" laboratory.

For the last 20 months, I have also been the chairman of the Metropolitan Air Quality Council of Denver. This group is the lead planning agency for the six-county region that comprises greater Denver. It is composed of leaders from the public and private sector - twenty in all. Included in its membership is the President of the Denver Chamber of Commerce and the CEO of Colorado's largest bank, the head of the Colorado Public Service Company, and several state legislators. When Governor Lamm established it, he instructed us to concentrate on Denver's carbon monoxide problem -- the worst in the United States at the time out of 305 urban communities. It is now 304th, so I suppose we have made some progress recently. Actually, we really have made some significant strides as you heard last week in the testimony of Senator Wirth and Mayor Pena, but we have a very long way to go, and the fact remains that Denver faces stiff federal sanctions by the end of 1987 for violating the CO standard. We are, however, likely to attain the ozone standard in Denver in 1987.

On those days when Denver is suffering through an especially bad episode of air pollution, the patients at National Jewish call us to complain. They tell their nurses; they tell their doctors; they tell the hospital's administration. Our outpatients, who for the most part are from Denver - unlike our inpatients, call to cancel their clinic appointments. They are simply not feeling well enough to travel. The complaints specifically center on tightness in their chest, of light-headedness, of dizziness, and headache.

Now, it should be noted again that virtually all our patients have something wrong with their lungs. About 70% of our patients have asthma. About 10% have emphysema. About 10% have other pediatric and adult pulmonary disease. And it must also be noted that these patients are tough cases; the treatment failures who come to Denver from the East Coast and the West Coast and the Mayo Clinics and the Mt. Sinais, so I am talking about a very sensitive population.

Another noteworthy occurrence happens on high pollution days at National Jewish: our doctors tell our patients and our staff as well, "DO NOT EXERCISE OUTDOORS TODAY." The Committee needs to know that exercise and physical fitness are key components in the treatment regimen at National Jewish for pulmonary disease so this advise is given very reluctantly indeed.

One other key fact must be brought to your attention this morning. And that is the metropolitan Denver area has an age-adjusted death rate from asthma, emphysema, and other chronic obstructive lung diseases that is 30% worse than the national norm and is in the worst 10% of the country. There are several possible explanations for this troubling statistic, but at a three-day conference held this past summer in Keystone, Colorado, a group of nationally prominent epidemiologists, toxicologists, and pulmonologists determined that air pollution could well be the leading cause for this figure which was produced by and validated at the highest level of statistical certainty by the United States Department of Health and Human Services. A monograph published last year by the National Academy of Sciences also featured a map that showed possible "hot spots" in the U.S. for air-pollution triggered lung disease. Denver was one of the dozen or so areas highlighted.

Now that I have presented these facts to you, I must address the question of the pollution itself. The metro Denver area has significant compliance problems with particulates, oxides of nitrogen and ozone as well as carbon monoxide. Currently, we are within acceptable levels for NOX and, as mentioned, are close to attaining that level for ozone. It is important to note that in Denver ozone violations occur only during the summer months. That is not the time of the year that our patients typically complain of symptoms.

Health concerns arising from air pollution occur in Denver mostly during the winter months. That is the "high season" for carbon monoxide and particulates. Much is not known about the composition of the particulate pollution in Denver - where it comes from, what its precise components are, where it is on bad pollution days and where it moves. Much better information is available on the specifics of carbon monoxide in Denver.

We know that 75% of the carbon monoxide in Denver comes from automobiles and that the number of vehicle miles traveled is growing rapidly even though Colorado's economy has been very sluggish for the past few years. We know that CO is at ground level where the people are. We know that its highest concentrations are found in the downtown area where people come in to work and where many of the region's poor live. We know, too, that the zone of high CO pollution stretches beyond the immediate downtown area, including most of the city's hospitals.

While I have been among those calling for additional research into the composition of Denver's particulate pollution, the so-called "Brown Cloud," and also for further study into the health effects of air pollution at altitudes like Denver's 5,000-foot elevation with 20% less oxygen that is found in its air and the differences in human breathing patterns at such elevations - topics that have received pitifully little attention to date - I believe that the current information we now have available to us tells us that air pollution in general and carbon monoxide in particular are dangerous to human health at the levels they are found currently in Denver and that aggressive actions must be taken to reduce ambient levels of air pollution now found in so many of our cities.

The fact that we lack all the data we desire to make the most precise policy calls should not result in backsliding now that deadlines are fast approaching. If we must compromise, let us do so on timetables not standards - not when the laboratory-based evidence and the case studies point to genuine health effects resulting from unacceptably high levels of carbon monoxide and other air pollutants.

Thank you for your attention.

Congressional Testimony
Subcommittee on Environmental Protection
Senate Committee on Environment and Public Works

March 18, 1987

Bernard D. Goldstein, M.D.
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My name is Bernard D. Goldstein, M.D. I chair the Department of Environmental and Community Medicine of the University of Medicine and Dentistry of New Jersey(UMDNJ)-Robert Wood Johnson Medical School. I also direct the Graduate Program in Public Health, and the Environmental and Occupational Health Sciences Institute, joint programs of Rutgers University and UMDNJ. My past experience includes service from November of 1983 to August of 1985 as Assistant Administrator for Research and Development of the Environmental Protection Agency. Previous to that I had chaired EPA's Clean Air Scientific Advisory Committee (CASAC) and the Toxicology Study Section of the National Institutes of Health. My scientific studies include evaluation of the effects of ozone, nitrogen dioxide, and benzene. In addition, I have written a number of review articles on the health effects of air pollutants. I currently chair two NAS/NRC Committees, serve on its Board on Environmental Science and Toxicology, and have been active recently in World Health Organization efforts concerning setting air pollution guidelines and evaluating risk assessment methodology for environmental pollutants.

I deeply appreciate the opportunity to speak to you today on the subject of the health effects of carbon monoxide. I also hope to make a short comment concerning one aspect of ozone control, that of the scientific rationale for an ozone standard with an averaging time in the range of 8 - 12 hours.

The subject of carbon monoxide is not one for pride among those of us involved in the interface between science and regulation. The original carbon monoxide standard was based in essence upon one study which appeared to demonstrate a decrease in psychomotor function at levels of carbon monoxide resulting in 2-3% carbon monoxide hemoglobin (COHb; carboxyhemoglobin). However, many studies since then have shown that there is an apparent threshold for this effect at about 5% COHb, and that the earlier study on which the standard was based could not be replicated. As this information was developing, an increased understanding of the basic toxicology of carbon monoxide on heart function led to studies of the effect of carbon monoxide on individuals with impaired blood supply to the heart. Not surprisingly, these studies, from two different laboratories, showed that subjects with angina had a decrease in exercise tolerance due to exposure to carbon monoxide. The scientific group producing most of this research, that of Aronow, reported statistically significant effects occurring at COHb levels also in the range of 2-3%. Accordingly, the original standard for CO then appeared appropriate for effects on cardiac function, rather than psychomotor effects.

Subsequently, Aronow admitted that he had been loose with his data in an investigation of a drug completely unrelated to studies of carbon monoxide effects. This led to a more intensive review of his findings and a recommendation to EPA by a scientific panel that, in essence, the numerical data in Aronow's studies be removed from consideration for regulatory purposes. However, and let me emphasize this, the Clean Air Scientific Advisory Committee of EPA recorded its belief that, even without the Aronow findings, the data base was reasonably consistent with the present standard. This also was my personal recommendation as Assistant Administrator at EPA to both the Administrators I had the privilege of serving under. I strongly supported, as did CASAC, the call for the intensive research effort that is now under way.

Before discussing this research, let me describe to you the scientific knowledge base that underpins a general willingness to believe that there is some level of CO exposure that will produce a decrease in exercise tolerance in individuals with angina syndrome, and that this may occur at relatively low levels of carbon monoxide.

The only proven toxic effect of CO is to interfere with the ability of red blood cells to carry oxygen. Over 90 percent of red blood cell protein is in the form of hemoglobin, which has the property of binding with oxygen in the lung and releasing the oxygen in the tissues. Carbon monoxide combines with the oxygen-combining site of hemoglobin, thereby preventing oxygen from being carried. The affinity of hemoglobin for carbon monoxide is approximately 200-fold greater than oxygen. Therefore, breathing 0.1 percent carbon monoxide (1,000 parts per million) in a 20 percent oxygen atmosphere would lead to 50 percent of the hemoglobin being bound to the COHb and 50 percent to the oxygen. This is a fatal level, inasmuch as carbon monoxide also interferes with the release of the remaining oxygen from hemoglobin at the tissue level. Fortunately, it requires 8 to 16 hours, depending upon respiratory rate, to achieve a steady state - otherwise smoking one cigarette would be fatal. One pack-a-day cigarette smokers usually have COHb levels in the range of 5%. There is a background level of about 0.5 percent COHb due to the formation of carbon monoxide during the metabolism of normal body constituents.

Impaired circulation within the heart muscle (arteriosclerotic heart disease) may produce the anginal syndrome in which exposure or stress-induced increased oxygen demand in the heart leads to chest pain. It would be anticipated that individuals with this disorder would be susceptible to even low levels of carbon monoxide due to decreases in the blood oxygen-carrying capacity caused by this pollutant. In essence, the decrease in oxygen in the blood, in conjunction with the rigid narrowed asteriosclerotic coronary arteries, leads to a lesser degree of exercise tolerance.

Our current situation is one of waiting for a series of research projects to be completed. These projects address the issue of whether carbon monoxide produces adverse effects in individuals with pre-existing cardiovascular disease and at what level any such effects occur. Many of these studies are being funded and coordinated by the Health Effects Institute, which receives its support from the automobile industry and from EPA. In my view HEI has done an excellent job. They have paid particular attention to issues of quality control and of comparability among the investigators, and have developed an excellent peer review process. Accordingly, I have faith in the integrity of the science and of the process that will review the science. What the science will show remains to be seen.

Parenthetically, may I add that there has been a major improvement since the last Clean Air Act amendments in the ability of EPA to focus on those crucial uncertainties underlying regulatory decisionmaking. This has been particularly obvious for the primary air quality pollutants. I believe that the congressional mandate to form CASAC, and the type of congressional overview exemplified by today's hearing, have been important factors in this improvement.

Although, as requested, the major focus of this testimony has been in the area of carbon monoxide, I appreciate the opportunity to say a few words about ozone which is another subject under consideration by the Committee. My remarks will be limited solely to the question of the appropriate averaging time for the ozone standard and will advance the thesis that appropriate public health prevention requires a time period of 8-12 hours, rather than just the current one hour period.

The one hour averaging time was derived from the original studies in Los Angeles showing that the photochemical process initiated by sunlight reacting primarily with automobile exhaust components led to a sharp peak of ozone in the forenoon. However, we have shown for the State of New Jersey that ozone episodes very often last 8-12 hours with relatively little change in ozone levels from hour to hour. We believe the same pattern is true for most of the non-attainment areas of the United States, including California. Furthermore the 1 hr peak level was not always a good predictor of the 8 hr average. For example, in New Jersey about 25% of the time that 8 hr averages were above 100 ppb, the 1 hour peak was less than 120 ppb, the current ozone standard. This pattern of exposure, coupled with the toxicology of ozone, has led my colleagues and I to recommend an 8 hour standard. The key points about ozone toxicology are its radiation-like effects which raise the specter of long-term chronic toxicity; its mode of action which suggests that multiple hours of exposure may be particularly harmful in comparison to other air pollutants; and the apparent greater sensitivity of children. From a public health point of view it is particularly troublesome that the warm summer days during which these daylight multi-hour ozone episodes occur are just those days when children will be out of doors exercising for much of the time.

This question has been considered by a WHO European Program scientific working group, on which I served, and has led to a formal recommendation of both a 1 hour and an 8 hour ozone guideline for Europe. I believe it would be highly appropriate for EPA to intensively evaluate the basis and the implications of an ozone standard which covered the daylight hours.

I thank the Committee for allowing me to testify on this matter.

AIR QUALITY STANDARDS FOR CARBON MONOXIDE

Stephen M. Ayres, M.D.

Dean, Medical College of Virginia/Virginia Commonwealth University

Carbon monoxide is a colorless and odorless gas produced by the incomplete combustion of fossil fuels such as home heating oil and wood. Automotive pollution and cigarette smoking are the most common sources of carbon monoxide in modern life. It combines chemically with hemoglobin to form carboxyhemoglobin (COHb), a substance readily measured in the blood or in breath sample in much the same way that alcohol is measured by a breath test.

Carbon monoxide is easily measured and is frequently used as a signal for the presence of other products of combustion (oxides of nitrogen, particulates, aldehydes etc.) In this respect it is like the canary used by Welsh coal miners to detect carbon monoxide and thus the other products of combustion.

Carbon monoxide differs from other pollutants in a number of important ways. It does not irritate the lung or directly injury tissue at usual concentrations but competes with oxygen for the life-giving red blood pigment, hemoglobin. Hemoglobin prefers carbon monoxide to oxygen 200 fold so that even minute amounts of the toxic gas will displace oxygen from hemoglobin. Carboxyhemoglobin is unable to carry oxygen. It has a much more insidious effect than merely inactivating the hemoglobin flowing in the circulation; it also damages the hemoglobin that it does not combine with and this indirect effect makes that untouched hemoglobin less useful for carrying oxygen.

Carbon monxoxide, like all automotive pollutants but unlike most other pollutants is produced by multiple point sources. Automobile exhaust is produced at street level and is diluted by the immediate atmosphere so that concentrations are highest close to the street. Concentrations decrease within yards above or away from these individual point sources. Frequently, the idling engine produces more carbon monoxide than the engine performing at optimal speed. For this reason, air quality sampling in the traditional way underestimates the amount of carbon monoxide in the environment. A sampling port ten feet above the street or remote from areas of peak traffic congestion would not indicate the true risk to pedestrians and other drivers. The location of sampling ports is complicated because a location at street level extremely close to traffic sources would almost always produce concentrations much higher than permitted by present standards.

It is difficult to determine compliance or non-compliance by air quality sampling because government has not taken advantage of the most accurate method possible-collection of expired air samples from designated groups of people in areas of high expoosure. This technique is important because of the differences in air and blood concentrations of carbon monoxide. If one moves from an areas of high concentration to low concentration of carbon monoxide, atmospheric concentrations fall rapidly. Blood concentrations remain high, however, because it takes hours for carbon monoxide to be removed by the body from its hemoglobin while it only takes minutes for the body to attract carbon monoxide to it.

The ability to estimate the body burden of carbon monoxide by measuring expired air samples make the determination of health effects much simpler than for most pollutants. Experimental studies with the breathing of pure carbon monoxide have demonstrated that patients with coronary artery disease are much more sensitive to carbon monoxide than normal individuals. In these patients, the heart is chronically starved for oxygen; a small concentration of carbon monoxide tilts the balance and the individual exposed experiences major abnormalities. Present day air-quality standards are based on observations in patients with coronary artery disease and angina pectoris.

Health Effects of Carbon Monoxide Exposure

Studies performed by John Scott Haldane on himself at the turn of the century demonstrated that health effects were observed in normal individuals when carboxyhemoglobin concentrations were suddenly raised above 15%. Experiences following the second world war demonstrated that concentrations close to 10% could impair specialized tests of mental function in normal young men. Detailed cardiovascular studies performed in patients with coronary artery disease demonstrated a deterioration of myocardial metabolism when carboxyhemoglobin concentrations were suddenly raised above 4%. Subsequent studies during driving conditions and in the laboratory during treadmill exercise confirmed that blood levels below 4% carboxyhemoglobin in the non-smoker produced an adverse health effect. Since smokers frequently have concentrations above 5%, they are probably at long term risk from carbon monoxide but may not be at as much risk in traffic as the non-smoker because the actually lose carbon monoxide to the environment when they are not smoking.

These studies have been replicated in at least three laboratories and additional studies are currently underway by the Health Effects institute. While it may be argued that only the most severely ill patients with coronary artery disease are at risk since they were the kinds of patients studied, the prevalence of coronary artery disease makes control of carbon monoxide extremely important. More than 50% of individuals over the age of 40 have demonstrable disease of the coronary arteries, sudden cardiovascular death is a major cause of death in middle age, and death from cardiovascular death remains the most common cause of death in the United States today. It is difficult for the reasons presented above to predict the blood carboxyhemoglobin in individual people from air sampling measurements. In addition, the use of the catalytic converter has decreased the concentration of carbon monoxide in many environments even though other pollutants remain. Thus it is no longer as useful as a "signal" for other pollutants. For these reasons, it is important to maintain a standard which contains a sufficient safety factor so that sensitive individuals are protected from adverse health effects.

Recommendations:

(1) Maintain the present environmental standards for carbon monoxide

(2) Determine compliance by turning to a carboxyhemoglobin requirement and develop a method for sampling populations in urban areas that appear to be in non-compliance by air quality sampling.

CARBOXYHEMOGLOBIN CONCENTRATIONS IN NEW YORKERS

Group	Concentration (%)	
	Nonsmokers	Smokers
Policemen (high)[a]	3.14 ± 0.74[b]	8.11 ± 2.51
Policemen (low)	2.29 ± 0.57	6.39 ± 2.66
Tunnel workers	2.93 ± 1.36	5.01 ± 2.25
Bridge workers	2.12 ± 1.08	3.90 ± 2.13
Union Square[c]	1.93 ± 0.35	3.89 ± 2.06
Hospitalized	1.56 ± 0.35	

[a] High and low refer to highly and less highly congested precincts in New York City.

[b] Mean ± SD.

[c] Union Square studies are on New Yorkers picked at random.

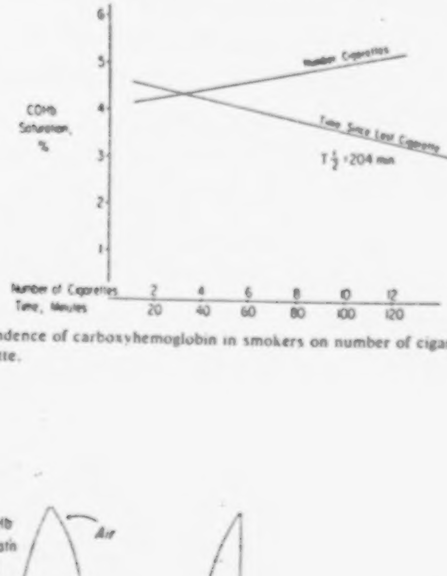


FIG. 3. Dependence of carboxyhemoglobin in smokers on number of cigarettes smoked and time since last cigarette.

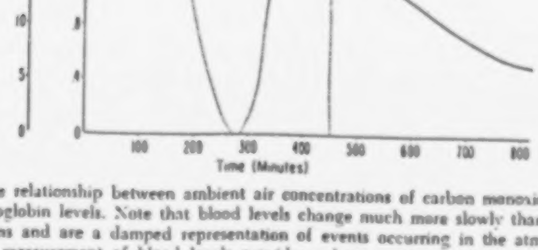


Fig. 12. The relationship between ambient air concentrations of carbon monoxide and blood carboxyhemoglobin levels. Note that blood levels change much more slowly than ambient air concentrations and are a damped representation of events occurring in the atmosphere. For this reason, measurement of blood levels provides a better estimate of the body burden of carbon monoxide. (Redrawn from Goldsmith and associates.[43])

Robert F. Phalen, Ph.D.
Director: Air Pollution Health Effects Laboratory
Professor of Community & Environmental Medicine
College of Medicine
University of California, Irvine

Statement on the Health Effects of Ozone
(March, 1987)

My testimony deals with the issue of human health effects associated with ozone levels in the South Coast air basin. I would like to discuss four topics from the point of view of my training and research experience in the area of the health effects of inhaled air pollutants. It is good to bear in mind that the average adult breathes 10-20 thousand liters of air per day and consumes only 1-2 liters of food and of water during the same period. Thus the potential for significant contact with toxic agents is quite large by way of the inhalation route.

The first topic relates to the toxicity of ozone. It is a strong oxidant gas that penetrates deeply to the very delicate tissues (alveoli or air sacs) of the lung upon inhalation. In numerous studies of laboratory animal species (that have been demonstrated to be good models for human lung tissues), the effects seen at our ambient air concentrations are cause for concern. These effects include: 1) the killing of critical cells in the lung, 2) interference with the ability of the lung's self-cleaning mechanisms 3) a decrease in the lung's ability to kill viruses and bacteria, 4) impairment of the immune system and increased expression of lung tumors in susceptible strains of animals, and 5) a loss of integrity of tissues in relation to their leakiness to body fluids and foreign chemicals. Several other effects have been documented. Thus the scientific evidence on ozone is very clear; even at relatively low concentrations it is harmful to health. It is a very toxic chemical. If it could be banned from our breathing air we would be better off.

The second topic involves the need for an adequate safety factor for human populations exposed to ozone. In this country we have an enviable record, compared to many other countries, for protecting public health from the effects of overexposure to harmful chemicals in our air, drinking water, food, and medications. This good record is not due to making close calls, assuming thresholds or ignoring toxicological data. Our protection of public health has been due to extensive laboratory toxicity testing (of chemicals, food additives and medications), the application of adequate safety factors when translating laboratory animal data into permissible human exposures, and our long-term follow-up monitoring of human populations that are eventually exposed to the chemicals in question.

The accepted, and proven, safety factors in this process are seldom less than a factor of 10 and in some cases greater than 1,000. This means, for example, that large human populations would be permitted exposure only to say 1/10 of the smallest dose of a chemical that produced an adverse effect in any laboratory animal species. As discussed in my 1984 book Inhalation Studies (pg. 214-220) use of a safety factor of 10 (for certain medicines) can still be associated with adverse effects in 3% of the exposed human population. This is due to the great variability in humans with respect to body size, metabolism, nutritional and health status and other factors. It is important to note that even when using a safety factor of 10 in some cases approximately one in 30 people are likely to be adversely affected.

Clearly we cannot maintain a safety factor of even 10 for environmental ozone because exposures of rats to concentrations of only 0.2 or 0.3 ppm leads to adverse effects. However, we should use as great a safety factor as is possible from the point of view of protecting human health.

The third topic involves young children (younger than about 5 years), a population whose inhalation exposure to air pollutants has been one of my research specialties over the past few years. Several factors are important to consider regarding children. First, they are born with immature lungs and inadequate defenses. The typical 6-month old has about 10 respiratory tract infections per year and the average between age 0 and 5 years is about 6 respiratory tract infections per year. Second, smaller people must breathe large amounts of air per pound of body weight in order to maintain their normal metabolism. A newborn at rest, for example, breathes more than 3 times the amount of air per pound than does an adult. This greatly increases newborn's dose from air pollutants. Another factor is that children's air passages are smaller and thus can collect a larger fraction of the airborne pollutants than adults. Children must be considered as an unusually sensitive group in comparison to adults when air pollutants are considered. Adding all of these factors together argues for an additional safety factor of perhaps 5-10 for children in relation to adults.

The fourth topic relates to mixtures of pollutants. We never breathe air pollutants singly in pure forms; a mixture is always present in the environment. Most studies of ozone have been with that gas alone. The thousands of potential combinations, with acids, soot, oxides of sulfur, oxides of nitrogen, etc., have only recently begun to be examined by toxicologists. In our laboratory we have found that other pollutants do not always intensify the harmful effects of ozone. However, the gas NO_2 does strongly interact with ozone to make a mixture that is significantly more harmful than either gas alone. We must assume that other, as yet untested, combinations with ozone will produce such synergistic actions.

In conclusion 3 points can be made. 1) There is no doubt that human populations in the South Coast Air Basin are experiencing adverse health effects from the air pollutants and that ozone is a major contributor to the toxicity of this air basin. 2) The results of reliable animal studies clearly indicate that the types of effects that ozone produces are very deleterious to human health. 3) Finally, erosion of current air quality standards for ozone is very unwise from the point of view of protecting public health because we currently have no safety margin.

OZONE AND CARBON MONOXIDE STANDARDS: NONATTAINMENT ISSUES

Mobile Sources

THURSDAY, APRIL 9, 1987

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON ENVIRONMENTAL POLLUTION,
Washington, DC.

The subcommittee met at 9:32 a.m. in room SD-406, Dirksen Senate Office Building, Hon. George J. Mitchell, chairman of the subcommittee, presiding.

Present: Senators Mitchell, Baucus, Lautenberg, Stafford, Chafee, Durenberger, and Pressler.

OPENING STATEMENT OF HON. GEORGE J. MITCHELL, U.S. SENATOR FROM THE STATE OF MAINE

Senator MITCHELL. Good morning, ladies and gentlemen. Welcome to this morning's hearing which will focus on control of emissions from mobile sources. This is both a nonattainment and an acid rain issue. Oxides of nitrogen, or NO_x, is a pollutant common to both of these problems. NO_x and sulphur dioxide are transformed in the atmosphere to produce acidic deposition that harms our lungs and our environment. NO_x is also a key factor in production of ozone. Both of these problems require action.

Congress must act to control acid rain and deal with the problem of nonattainment because it is clear that the Administration will not. The third summit meeting between President Reagan and Prime Minister Mulrooney, concluded, without agreement, on how the United States will control its emissions of sulphur dioxide and NO_x.

Witnesses at this committee's hearings on March 26 on nonattainment testified that EPA has done little to provide needed guidance to State and local governments for control of ozone and carbon monoxide.

Those witnesses recommended that more stringent national emission controls, particularly on mobile sources, be put in place. If we fail to act, harm to the health of Americans and to the American environment will continue.

The panel of medical experts appearing before this subcommittee in February testified that health is at risk when humans are exposed to precursors of acid rain. Last week, we heard testimony from EPA scientists that people living in nonattainment areas, such as New York, Denver, and Southern California, face serious health risks. Mobile sources are a large contributor to this problem.

In Southern California it is estimated that 67 percent of the NO_x emissions are from mobile sources, and emissions from mobile sources are expected to increase.

More people are driving more cars more miles than ever before, and this trend is likely to continue. These increases are unacceptable if we are to protect the health of Americans, and protection of public health is the first priority of the Clean Air Act.

While some may contend that further reductions are impossible, I am encouraged by the great strides the motor vehicle industry has made over the past quarter century. Tighter emissions standards were met when they were required. Today's hearing should provide useful insights into the best way to achieve the needed emissions reductions for mobile sources in order to protect the health of America.

I am grateful to our panel of witnesses who have agreed to appear here today. There are eight in all, so to give everyone the chance to get their point across, I would like to ask all of the members to adhere to the Committee's rules for testimony, which are that your written statement will be placed in the record in its entirety. I ask each witness to take five minutes of oral testimony to summarize or to hit the highlights of the written testimony, and there will then follow a question period during which we hope to have some exchange between the witnesses, as well. We found that is the best way to elicit useful information for the Committee.

So we will proceed in the order that the witnesses are listed on the committee agenda. First is Mr. Samuel Leonard, Director of Automotive Emission Controls of General Motors Corporation.

STATEMENT OF SAMUEL A. LEONARD, DIRECTOR, AUTOMOTIVE EMISSION CONTROL DEPARTMENT, GENERAL MOTORS CORP.

Mr. LEONARD. Good morning.

Senator MITCHELL. Welcome. We look forward to hearing from you.

Mr. LEONARD. Thank you, Mr. Chairman.

Senator MITCHELL. When that orange light goes on, it means you have a minute to go. When the red light goes on, it means summarize and conclude.

Mr. LEONARD. Thank you, Mr. Chairman.

General Motors appreciates this opportunity to present its position on future mobile source emission standards.

In a nutshell. That position is that the current call for tighter mobile source standards must be evaluated on broad public policy grounds that go beyond hardware, technical data and air quality projections. One needs to acknowledge the further progress that will occur naturally as newer vehicles replace older ones and the policy consequences of imposing unrealistic additional requirements.

A number of bills are being considered which address concerns about continued nonattainment of national ambient air quality standards or acid deposition or both. The provisions of several of these bills imply that more stringent mobile source standards are feasible and will significantly improve the ambient air quality.

With respect to feasibility, it is not surprising that someone unfamiliar with the intricacies of the mobile source emission program could believe that more stringent emission standards are readily achievable. Examination of certification data indicates that many but certainly not all engine families have emission levels well below the current standards.

This data can be misleading. The certification process, no matter how well designed, cannot comprehend the wide variety of operating conditions vehicles will be subjected to in customer usage, and under the Clean Air Act, in-use performance is the manufacturer's engineering challenge.

Therefore, despite the consistently low emission levels of certification vehicles over the past six years, GM and other manufacturers are still struggling to achieve current standards in use. The incentive is there because failure means recall, and recall is expensive and very cost ineffective and is a significant inconvenience to our customers.

Our continuing efforts to improve in-use performance are showing very good results. In-use emissions of 1985 vehicles are significantly lower than those of 1981 vehicles, despite identical standards. Nevertheless, many of our vehicles remain at risk of recall, even though on average, the 1985 fleet is projected to meet today's emission standards in 50,000 miles.

Our goal is to achieve standards in use with a margin of compliance necessary to minimize the possibility of recalls. We have ongoing programs to continue our progress toward accomplishing this goal. The more stringent provisions of presently proposed legislation would, however, significantly compromise our ability to meet this goal.

The basic problem is that there is no new major technology break-through on the horizon. Future improvements will come in small bits and pieces. Such improvements must be in fuel control, catalyst, combustion chamber design or other areas. The bottom line, though, is that future improvements will result from a continual learning process with today's technology.

This learning process may enable us to certify some of our smaller engines to more stringent standards; however, it is likely that some engine families would be threatened by more stringent standards. This danger is greater for a full-line manufacturer such as GM, which offers a broad product range which includes large engines needed for family-size vehicles.

The major problem with these legislative proposals, however, is in the area of in-house compliance. Nothing in the current in-use data indicates that technology is available which will allow compliance in use by our full range of vehicles with provisions such as 0.25 gram per mile hydrocarbon or 0.4 NO_x or even with current standards for ten years of 100,000 miles.

The hydrocarbon, CO and NO_x provisions for light duty trucks and the knocks provisions for heavy duty trucks present even greater problems.

The question, then, is: What air quality benefit does the nation get in exchange for imposing this added burden on the domestic auto industry and its customers, whose costs will necessarily increase?

EPA recognizes that there is little air quality benefit to be achieved through more stringent standards. It is clear that the greatest future air quality benefit from mobile sources will be obtained through older vehicle replacement, elimination of misfueling and tampering, and continued efforts to address in-use emissions.

EPA projects that total vehicle emissions will decrease more than 50 percent from 1984 to 1995 with current standards and that projection does not comprehend the improvements we have made in emission control system performance from the 1981 models through 1985.

In sum, more stringent standards will do little to hasten air quality improvements.

Finally, I would emphasize that more is involved than the pure technological question of whether more stringent emission standards are feasible or needed. Other public policy issues must also be considered. Competitiveness is a key issue because of the impact of the automotive industry on the economy and employment levels.

The difficulty associated with producing family-size vehicles with larger engines which can comply with more stringent emission levels could constrain production to smaller vehicles where foreign competitors have an acknowledged cost advantage.

Briefly, to summarize, General Motors Corporation must oppose any proposals to further reduce mobile source emission standards.

Thank you.

Senator **Mitchell**. Thank you very much, Mr. Leonard.

Before hearing from the next witness, I would like to recognize the presence of Senator Lautenberg.

Senator, do you have a statement?

OPENING STATEMENT OF HON. FRANK R. LAUTENBERG, U.S. SENATOR FROM THE STATE OF NEW JERSEY

Senator **Lautenberg**. Just very briefly, Mr. Chairman. I have a subcommittee to chair, and I did want to stop in and compliment you for holding this hearing today to examine the issue of possible additional controls on mobile sources.

Motor vehicles emit hydrocarbons, nitrogen oxides, and carbon monoxide. These cause major environmental problems for New Jersey and many other States, as these emissions contribute to the acid rain problem and the formation of ozone.

This subcommittee has heard a lot of testimony about the air pollution problem and its serious health effects. Of the 100 million people living in nonattainment areas, doctors are finding, that lung and respiratory problems are increasing. Although progress has been made in controlling mobile source emissions, we are here today to explore whether we need to take further steps.

A number of approaches, I understand, will be discussed today. We are going to hear from witnesses with a variety of perspectives. Mr. Chairman, I won't be able to be here. I look forward to reading the testimony, and I ask for the opportunity to submit any questions that we might have in writing and commend you for your diligence in this area.

Senator MITCHELL. Thank you very much, Senator. The witnesses will be asked to respond to questions in writing subsequently from any member of the Committee who wishes to submit them.

Thank you for your statement. We will now hear from Mr. Howard Padgham, Chief Engineer for Power Train Engineering Programs, Chrysler Motors.

STATEMENT OF HOWARD B. PADGHAM, CHIEF ENGINEER FOR POWERTRAIN ENGINEERING PROGRAMS, CHRYSLER MOTORS

Senator MITCHELL. Mr. Padgham, welcome. We look forward to your testimony.

Mr. PADGHAM. Thank you, Mr. Chairman, for inviting Chrysler Motors to testify at this hearing. We are aware that the Committee's interest in mobile source emissions control is based on both the acid rain phenomenon and the problems associated with the creation of atmospheric ozone.

It is Chrysler's view that the potential for additional improvements in tailpipe emissions from automobiles and trucks result in only small, if any, measurable contributions to reducing these air quality problems. In the limited time available, I will address the three technical issues about which you requested comments for this hearing.

First, certification as it relates to performance on cars. Because our nation is dedicated to achieving healthy levels of air quality and is paying a high price to do so, it only makes sense to assure that the standards of vehicles certified to by the EPA are, in fact, achieved in-use.

For this reason, Chrysler believes that reasonable testing in-use of vehicles is an important part of the mobile source emission controls program. The threat of vehicle recalls provides a very effective incentive for manufacturers to design and build vehicles with emission control systems that comply with the standards for their useful life, 50,000 miles or five years for passenger cars and 120,000 miles or 11 years for light duty trucks.

When you look at typical certification data, you will note that the emission values are well below the appropriate emission standards. This difference between the certification level and the standards represents a built-in safety margin to allow for production variations and once in our customers' hands, the wide variety of driving habits, fuel quality and maintenance practices that our vehicles are subjected to.

Consequently, it is unreasonable to assume that certification emission levels can be used as an in-use standard. Even with a safety margin, our systems occasionally fail in-use testing, and we are then subject to recall action. Clearly, we have a large incentive to avoid this risk.

On the second issue, tighter standards for light duty trucks. On the surface, it would appear that there is room to further reduce exhaust emissions from light duty trucks. This is particularly true when one compares the lower level of emissions required for California light duty trucks versus the standards for the 49 States' vehicles.

However, it is important to note that the 11 years/120,000 useful life required for the 49 States' light duty trucks is more than double that of California, which requires five years or 50,000 miles.

The result is that the 49 States' vehicles are, in effect, subject to controls at least as tight as California's because of the necessity to build in greater in-use margins of safety.

Tighter emissions standards may be achievable in future years, but allowances must be made for sufficient time to accomplish that task, because if significantly more stringent standards are adopted, technological breakthroughs may be required.

In this regard, Mr. Chairman, there is a significant debate under way over whether and how to control VOC emissions that escape during the refueling process of light duty trucks and cars.

EPA has estimated that these emissions represent only a 2 percent contribution to the VOC inventory. Yet the agency seems to be moving relentlessly towards requiring refueling emission controls. It is Chrysler's view that these controls are not a cost effective strategy.

On the third issue, methanol fuel vehicles, Chrysler supports the investigation and development of alternative fuels to reduce our nation's dependence on imported oil, and we believe that methanol is the most likely alternative fuel. We also recognize the potential benefit of the neat methanol fuels and vehicles in reducing vehicle emissions and improving air quality.

Just three days ago, Chrysler presented its position to the State of California in support of their investigation into these possible air quality benefits.

Although we believe the phase-in of the methanol fuels is best accomplished through dedicated vehicles designed to take full advantage of the unique properties of methanol, we also support the investigation of flexible fuel vehicles as an interim means to developing markets for methanol fuels and vehicles.

In either case, however, building the sequence of events to a level necessary to sustain a viable methanol fuel and vehicle market will not be easy. Therefore, we support the principle of government leadership to provide incentives to making fuels readily available and for inducing the purchase of vehicles, providing those incentives do not undermine the intent of EPCA.

In conclusion, Chrysler is proud of its accomplishments in greatly reducing vehicle emissions, and we are continuing these efforts to develop further improvements in emission control technology. We ask, however, that in considering new legislation you weigh the cost/benefits to society and recognize the substantial lead time constraints we face as an industry.

Thank you, Mr. Chairman.

Senator **Mitchell**. Thank you, Mr. Padgham.

Before hearing from the next witness, let me recognize Senator Baucus, who just came in. Senator, welcome. Do you have a statement to make?

Senator **Baucus**. No statement, thank you.

Senator **Mitchell**. Thank you, Senator.

We will now hear from Mr. Donald Buist who is the Director of Automotive Emissions and Fuel Economy Office of the Ford Motor Company. Mr. Buist, welcome. We look forward to hearing from you.

STATEMENT OF DONALD R. BUIST, DIRECTOR, AUTOMOTIVE EMISSIONS AND FUEL ECONOMY OFFICE, FORD MOTOR CO.

Mr. BUIST. Thank you, Mr. Chairman. In the short time I have, I would like to review the status of the three ambient air quality standards which relate to vehicles namely, nitrogen dioxide, or NO_2; carbon monoxide or CO; and ozone; discuss the impacts of tighter emissions standards and review our progress and concerns with respect to methanol.

Significant progress has been made nationwide with respect to NO_2 and CO ambient requirements. Nationwide, only portions of three counties are not in attainment of ambient NO_2 standards despite a very substantial growth in vehicle usage.

Most areas also are now in attainment with nationwide CO standards, and the remainder are very close to attainment.

Reduced emissions from motor vehicles are responsible for a large part of this success story. Today's car and light truck CO and NO_x emissions standards represent a 90 and 75 percent reduction respectively from uncontrolled levels.

However, attainment of the ozone standard has proven to be more difficult. EPA indicates that 73 areas presently are not in attainment and 40 are not projected to reach attainment by the December 31st deadline. It must be emphasized, however, that this has occurred despite hydrocarbon standards for all vehicles that require a greater than 90 percent reduction from uncontrolled levels.

In addition to the progress made thus far, further improvements in ambient air quality will continue as new vehicles with more sophisticated emission control systems replace older vehicles on the road today.

With respect to tighter emission control standards, several Senate bills would propose tightening motor vehicle emission standards. Some of the standards that have been suggested are clearly not achievable using known technology. Others would interrupt the steady progress which has been made in achieving low emission levels and result in unduly compromised fuel economy, driveability and other customer satisfaction attributes.

Even if the most stringent car and truck emission standards contained in the Senate bills were implemented, there would be a negligible improvement in total hydrocarbon emissions compared with the emissions reductions which will automatically occur without further changes in the standards. These automatic reductions will occur due to changeover of the in-use fleet to the latest low emitting vehicles. As shown on the easel chart to my left, our analysis of EPA's estimates of in-use emissions indicates that between the years 1986 and 2000, the hydrocarbon emissions of the average vehicle in the motor fleet will be reduced by about 56 percent without new standards. Factoring in the most stringent hydrocarbon standards proposed in the various Senate bills introduced this year would only improve the reduction by about one percentage point.

This certainly has to be a questionable improvement for such a dramatic reduction in the standards.

With respect to methanol, Ford believes that methanol may be the most promising long-term replacement for petroleum as a motor vehicle fuel. As methanol is considered part of any clean air strategy, there are some important questions that need to be answered:

One, what degree of ozone improvement can reasonably be expected when methanol is not cost competitive with gasoline?

Two, when can methanol be expected to be available in sufficient quantity and at a competitive price?

Three, are there other public health concerns related to the use of methanol as a transportation fuel?

Four, are customers willing to accept methanol vehicles and the use of the fuel considering the cost of the fuel, vehicle cost and basic mobility?

In spite of these serious concerns, Ford will continue its research efforts to eliminate many of the technical hurdles that remain for methanol-capable vehicles. To date, Ford has built over 600 prototype dedicated methanol vehicles. These vehicles have accumulated over 2.5 million miles in various fleets. The technical feedback from the field operators of these vehicles has been very positive.

We have now directed our attention to what we call the flexible fuel vehicle or the FFV. We consider this an interim but, nevertheless, a critical step in the overall approach to methanol.

Our research goal with the FFV is to design a vehicle which could operate on either methanol or gasoline or any random mixture of those fuels automatically, without the need for the driver to take any action. It is our belief that initially, the flexible fuel approach is the one to take, and we estimate that given four years' lead time, a fully functional flexible fuel system could be produced at least on one car line. Having noted the potential advantages of flexible fuel vehicles, Ford has put 12 prototype vehicles into service and has plans for 20 more.

In summary, with regard to the ambient standards for the three pollutants where automotive emotions play an important role, only ozone appears to be a major nonattainment problem. Achieving the ozone standard remains a difficult task in some areas, but further motor vehicle emissions control could not solve the ozone problem even if emissions were totally eliminated.

Any further tightening of today's motor vehicle standards will have a very minor impact on achieving the nation's ambient air quality standards. Annual fleet turnover will continue the already impressive progress in reducing automotive emissions. Thank you.

Senator MITCHELL. Thank you, Mr. Buist.

The next witness is Mr. Iida, manager of the Washington Office, Toyota Motor Corporation.

Mr. Iida, welcome. We look forward to hearing from you.

STATEMENT OF TEIJI IIDA, MANAGER, TOYOTA MOTOR CORP., WASHINGTON, DC, OFFICE, ACCOMPANIED BY RICHARD PENNA, SCHNADER, HARRISON, SEGAL AND LEWIS

Mr. IIDA. Thank you very much. Good morning. My name is Teiji Iida. I am manager of Toyota Motor Corporation's Washington, DC, office.

This morning I am accompanied by Mr. Richard Penna. I want to thank you for providing Toyota this opportunity to express its views on mobile source related issues under the Clean Air Act.

In March 1967, Toyota had the distinction of receiving the first certificate of conformity issued to a vehicle manufacturer under the Clean Air Act for our Tiara and Land Cruiser vehicles. This fact has been a source of encouragement to Toyota and has stimulated our efforts to comply with vehicle emission control standards.

Toyota is proud of the record we have achieved regarding compliance with emission standards under the Clean Air Act. We have not had any emission recalls since we began importing vehicles into the United States. Toyota has been making every effort to continue this level of performance, and we promise to keep up these efforts in the future.

Toyota has several concerns with portions of bills that have been introduced this year to amend the Clean Air Act. These are: A provision which would require the imposition of "on-board" refueling control systems on vehicles and proposals to make HC and NO_x tailpipe emission standards more stringent.

However, due to the lack of time, I would ask you to look at the figures that we provided at the end of the written statement as I summarize this testimony.

VEHICLE REFUELING CONTROLS

One of the bills introduced in this Congress contains a provision which would require the imposition of so-called on-board refueling control systems on vehicles by model year 1989. Toyota believes on-board controls are unwise and should not be required.

There are four reasons for this view. One, packaging. As figure I shows, on-board systems will be quite complex and consist of much more than an enlarged evaporative canister. New valves, switches vapor linese a liquid/vapor separator and seals will be required, in addition to a six- to eight-liter canister.

The photographs on figure II show the engine compartment on several 1987 Toyota models. In addition, figure III is a photograph of the actual canister assembly.

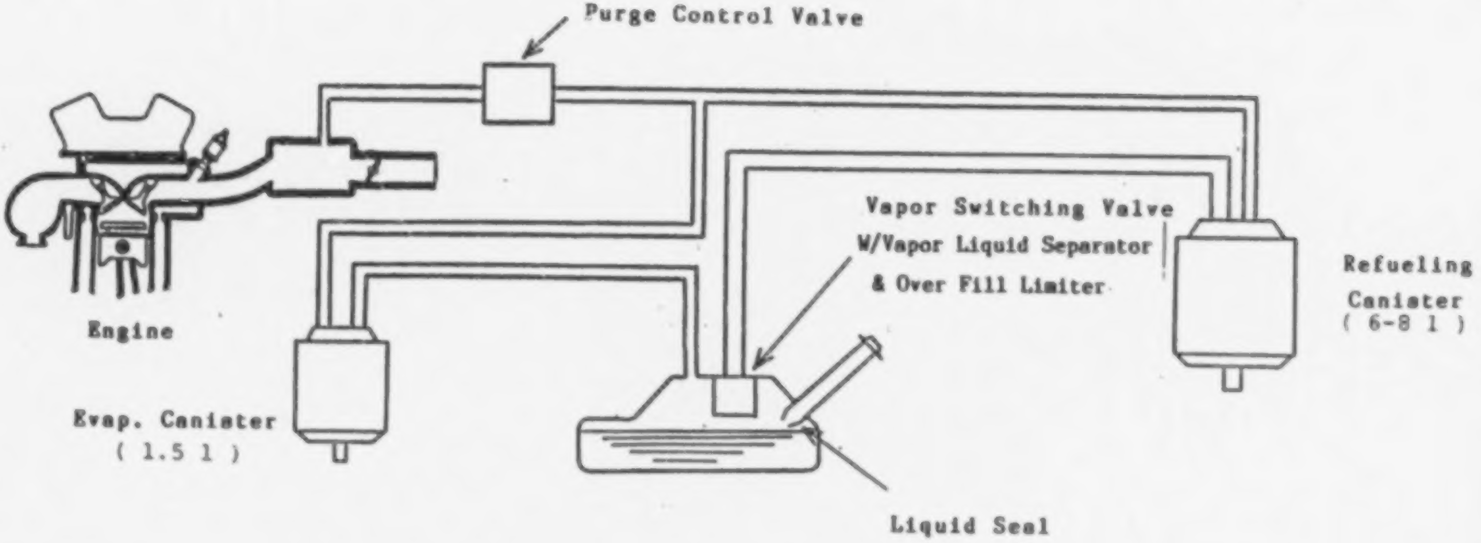


Fig. I On-Board System - Not to Scale

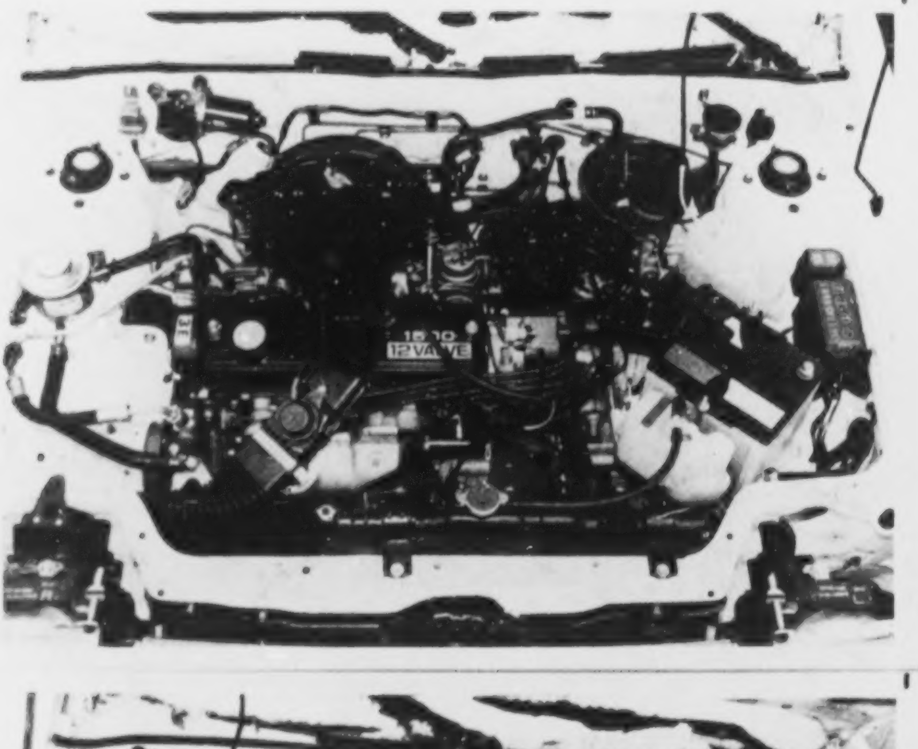


Fig. II Engine Compartment - 1987 Toyota Vehicles (Tercel - Top, Celica - Bottom)

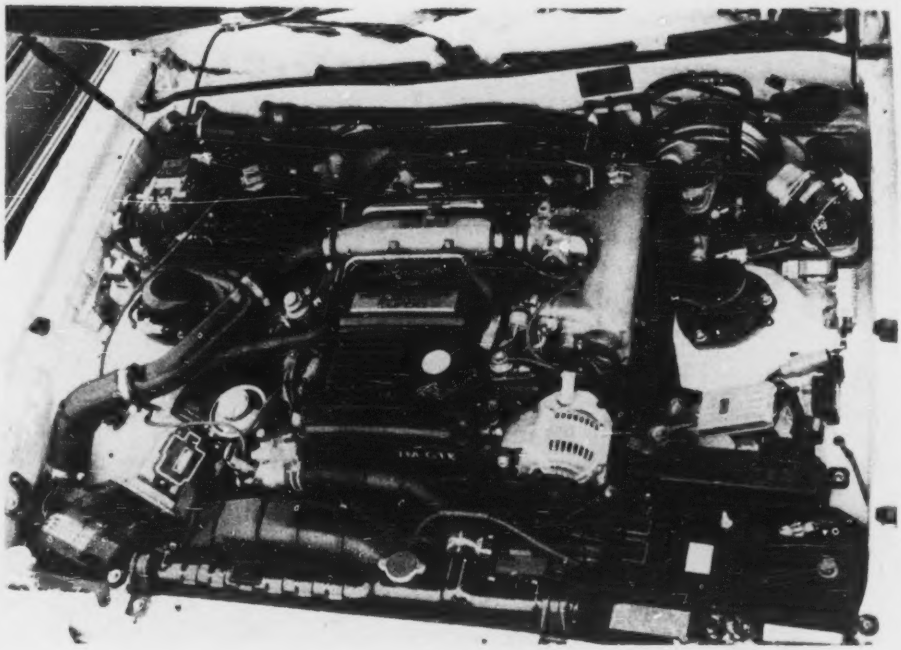


Fig. II - Continued (Supra Engine Compartment)

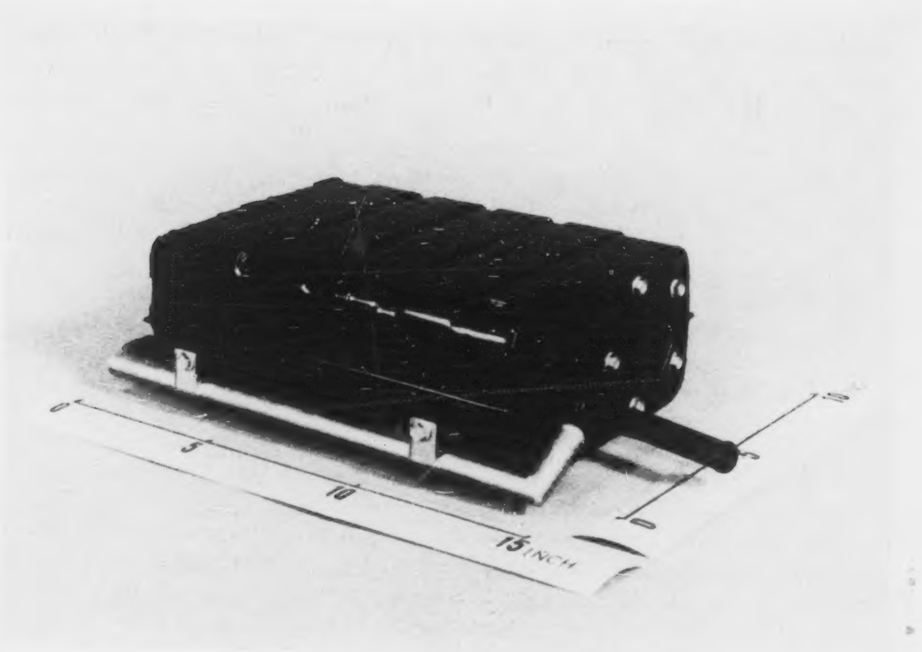


Fig. III Photograph of Canister Assembly

Mr. IIDA. If the system cannot be placed in the engine compartment, it must be placed in the rear of the vehicle. This will require redesign of major components of the vehicle body. Figure IV shows a sketch of the floor pan of one of our existing models. Figure V shows how this floor pan must be changed to accommodate the canister.

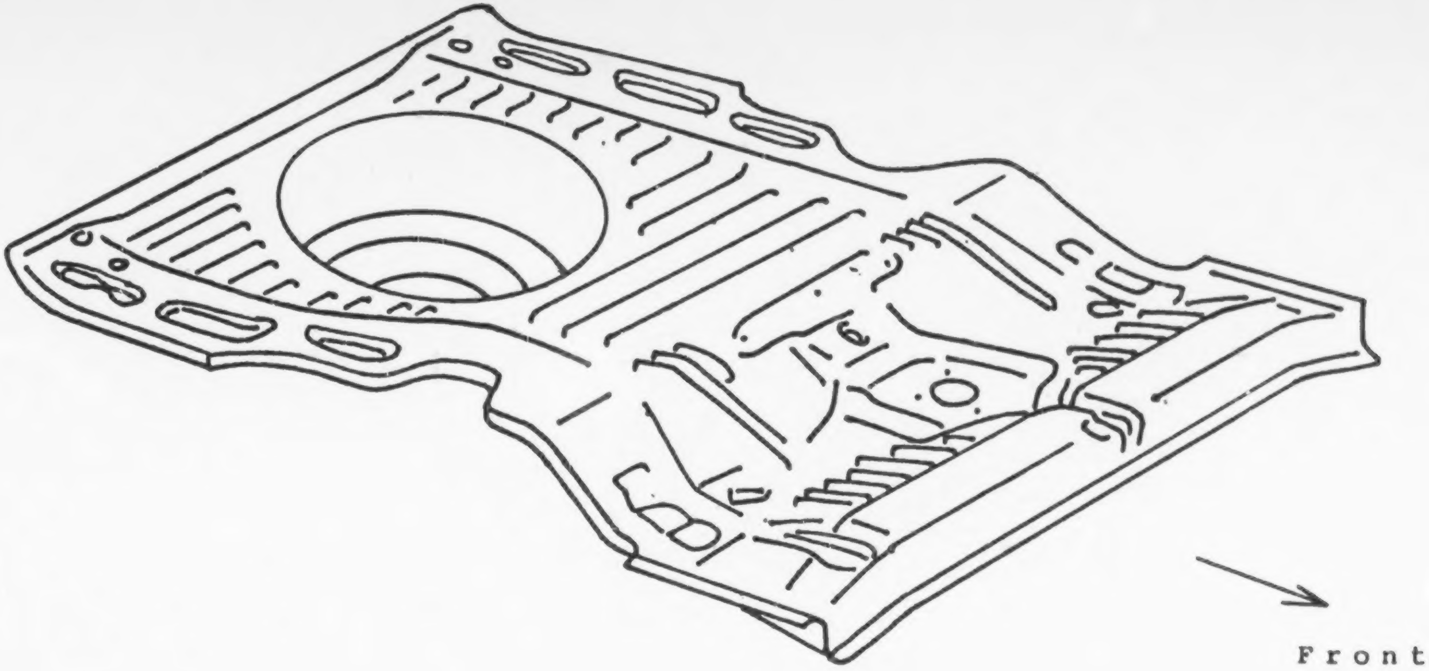


Fig. IV   Rear Floor Pan (Base)

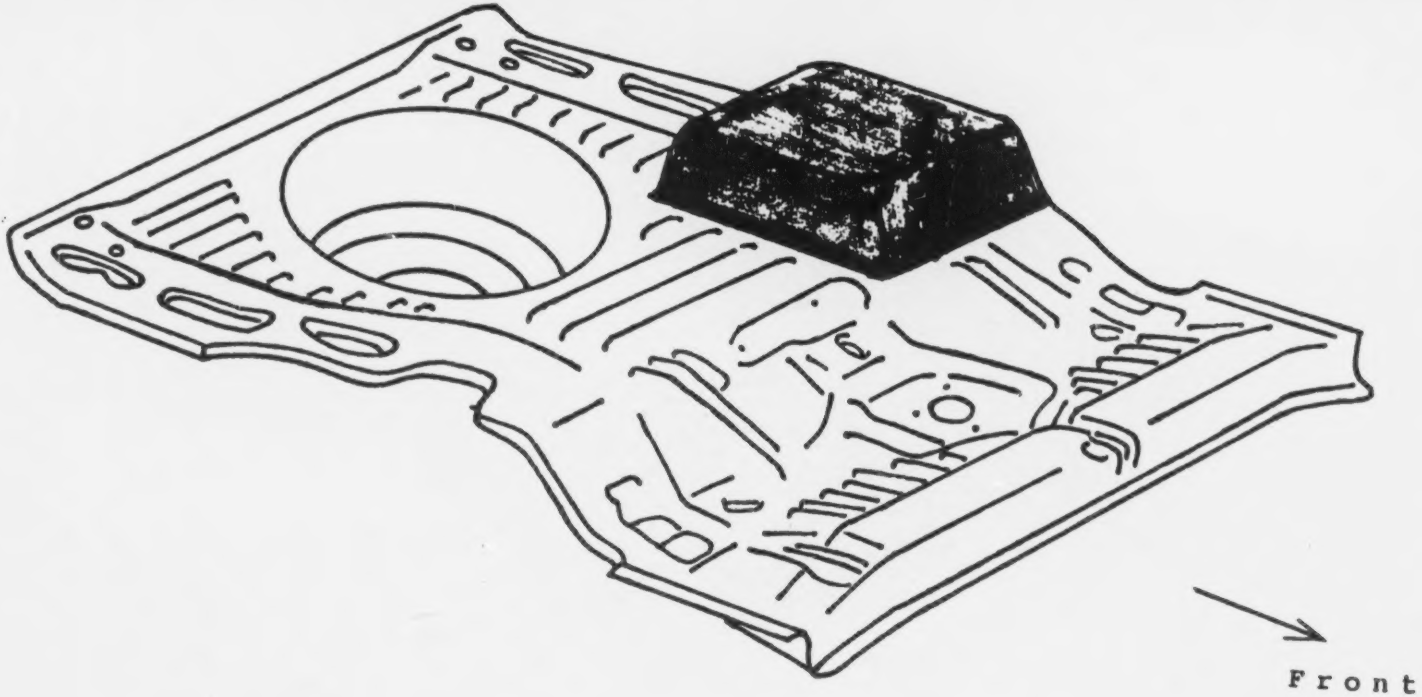
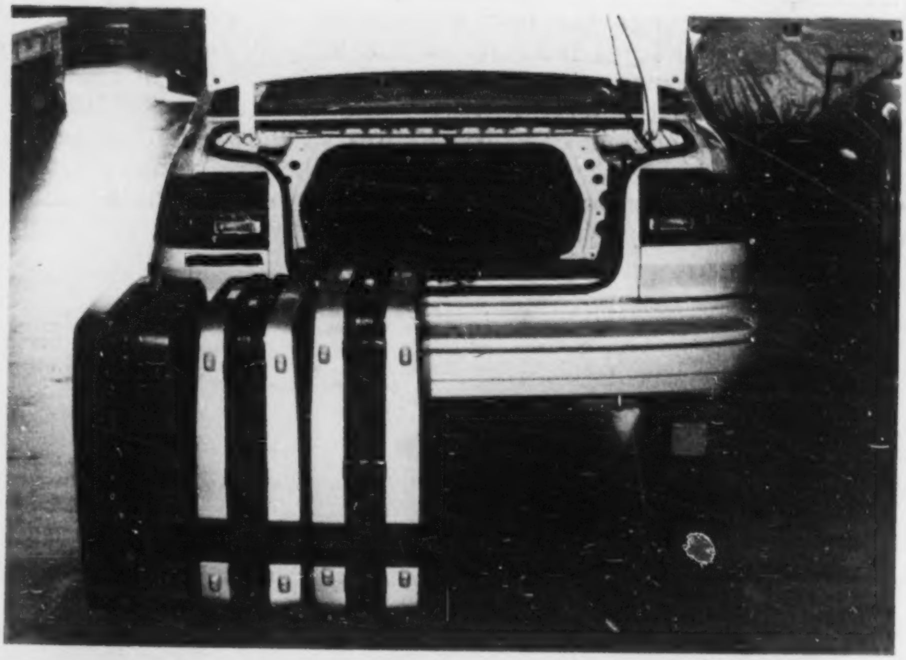


Fig. V Rear Floor Pan (Changed)

Mr. IIDA. Mr. Chairman, my background is in body structure engineering. I can verify that the floor pan is one of the longest lead time items to change due to the fundamental role the floor pan plays in the structural integrity of the vehicle, the effect of any change on the suspension system and the complexity of retooling.

The redesign of the body will lead to either the loss of luggage, cargo space or fuel tank capacity. Figure VI shows the luggage capacity of one of our existing 1987 models. The base vehicle is capable of carrying three large bags. The vehicle modified to stimulate an on-board refueling system can carry only two.



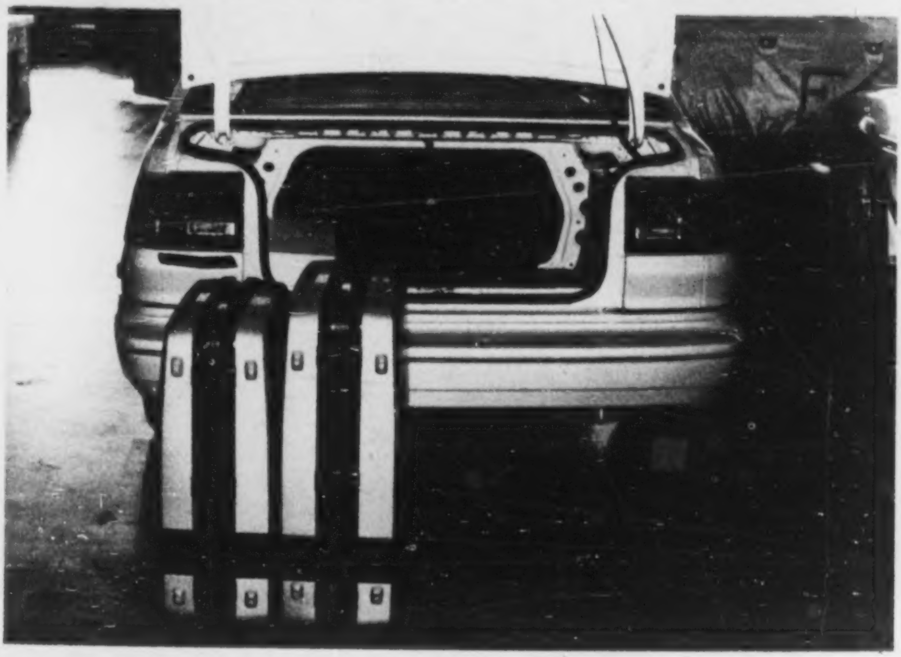


Fig. VI Luggage Capacity (Base Model - Top, On-Board Model - Bottom)

Mr. IIDA. A similar loss of fuel tank capacity will diminish the driving range for vehicles by 10 to 20 percent.

Two, unresolved technical issues. Toyota's existing testing program for on-board systems has shown that purging the gasoline vapors from the canister to the engine is a problem.

Given the difficulties we can anticipate meeting existing tailpipe standards with on-board controls, meeting a more stringent hydrocarbon standard such as that contained in S. 300 may be beyond the limit of existing emission control technology, particularly if onboard controls are required.

Three, leadtime. The combination of major structural changes as well as a redesign of the fuel system raises concerns about compliance with Federal Motor Vehicle Safety Standard 301, fuel system integrity.

Substantial crash testing will be required before final design and tooling can begin. Toyota estimates that in order to reduce the high costs associated with crash project redesign of structural components, at least six years 'lead time must be provided prior to any requirement for any requirement for these systems on all vehicles.

Four, cost considerations. EPA has used cost estimates of $19 per vehicle with a $5 credit for increased fuel economy. Toyota believes the EPA cost estimate is greatly understated.

Based on estimates received from our suppliers and taking into consideration the high level of the durability that Toyota feels is necessary due to the location of such systems, the cost of these systems is in the range of $80 to $115 per vehicle.

Due to the technical, cost and the lead time concerns addressed above, Toyota respectfully requests the subcommittee to reject any requirement to impose on-board controls on vehicles.

I thank you for allowing Toyota to present its views on this topic, Mr. Penna and I will attempt to answer your questions. Thank you.

Senator MITCHELL. Thank you, Mr. Iida.

We will next hear from Dr. John Wall, Director of Emissions for the Cummins Engine Company, Inc.

STATEMENT OF JOHN WALL, DIRECTOR OF EMISSIONS RESEARCH, CUMMINS ENGINE CO., INC.

Mr. WALL. Thank you, Mr. Chairman.

Cummins appreciates the opportunity to appear before you today. Our major products are diesel engines and engine components. Diesel engines have some advantages and some disadvantages compared to gasoline engines in controlling emissions. Because of the physics and chemistry of diesel combustion, carbon monoxide and gaseous hydrocarbon emissions from diesel engines are very low. On the other hand, NO_x and particulate emissions are difficult to control.

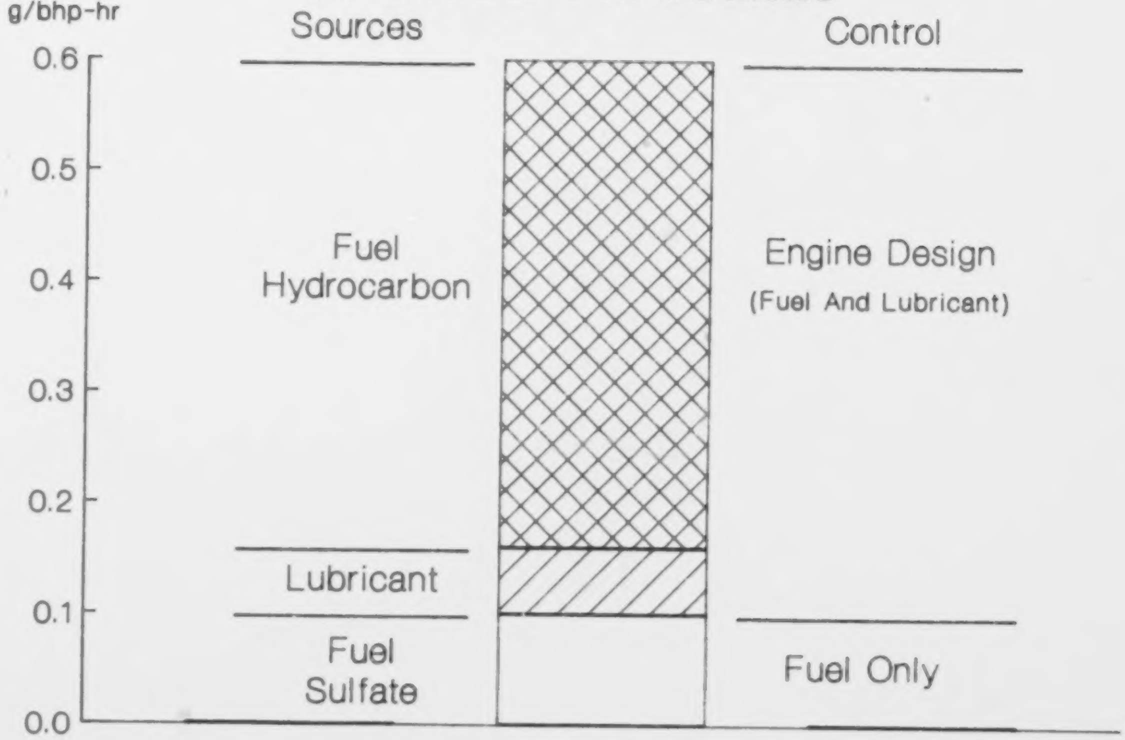
A new issue that has been recognized with regard to diesel emissions is that of sulfate formation, both as particulate emitted directly from the engine and as sulfate particulate formed from the atmosphere from gaseous SO_2 in diesel exhaust. The gaseous particulate formed in the atmosphere accounts for the bulk of particulate derived from diesel engines.

I would like to refer to several figures which illustrate the effect of fuel sulfur on diesel emissions.

Figure 1 shows the composition of diesel particulate at the 1988 standard. About 20 percent of the particulate is sulfate; about 10 percent comes from the engine lubricant; and the rest is caused by incomplete combustion of the fuel.

The fuel hydrocarbon and engine lubricant contribution can be reduced by engine design changes and to a lesser degree by fuel and lubricant modifications.

Figure 1 - **Source And Control Of Diesel Particulate**

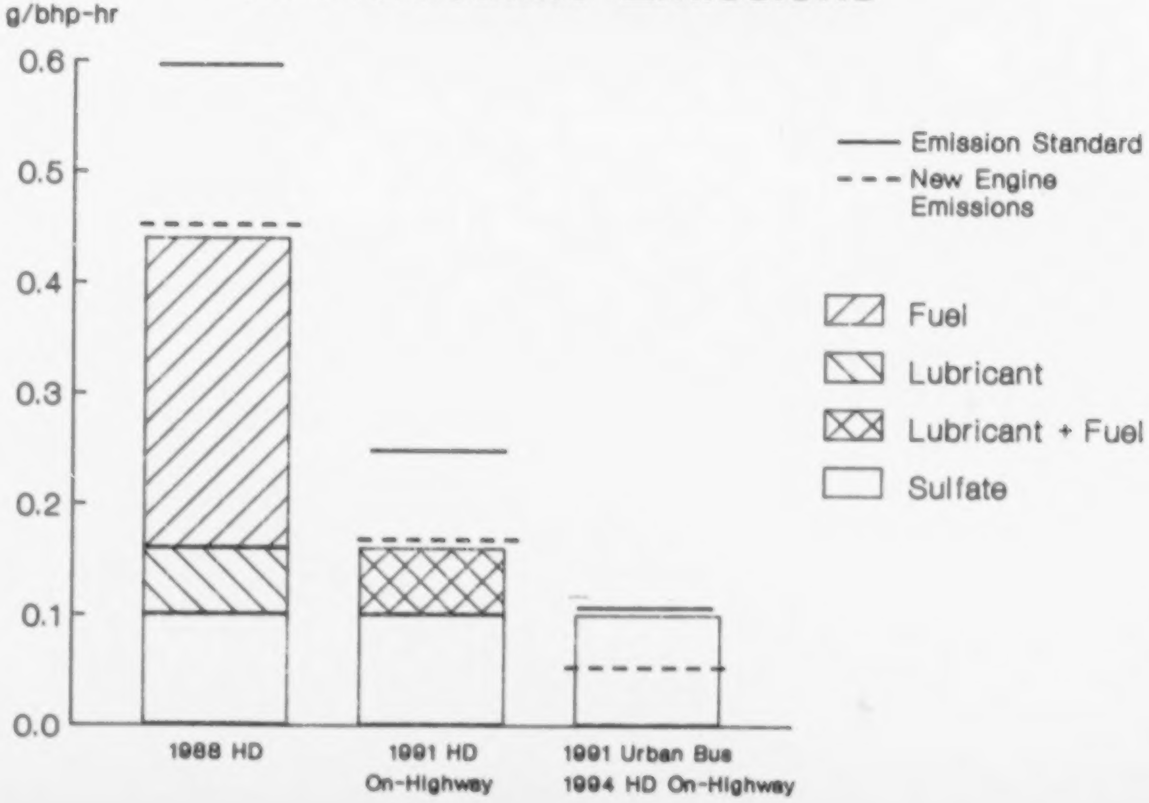


Senator **Mitchell**. What is the last portion of that statement?

Mr. **Wall**. By fuel and lubricant modifications to a somewhat lesser degree. We know of no way to reduce sulfate emissions except to reduce the sulfur content of diesel fuel.

Figure 2 illustrates how the composition of the particulate must change if we are to meet future particulate standards. On this graph, we have shown the legal standards in green and lower "design targets" in red. These design targets are the new engine emission limits that are required to ensure that at the end of the useful life period, these engines will still comply with their emission standards.

Figure 2 - **Contribution Of Fuel Sulfur To Particulate Emissions**



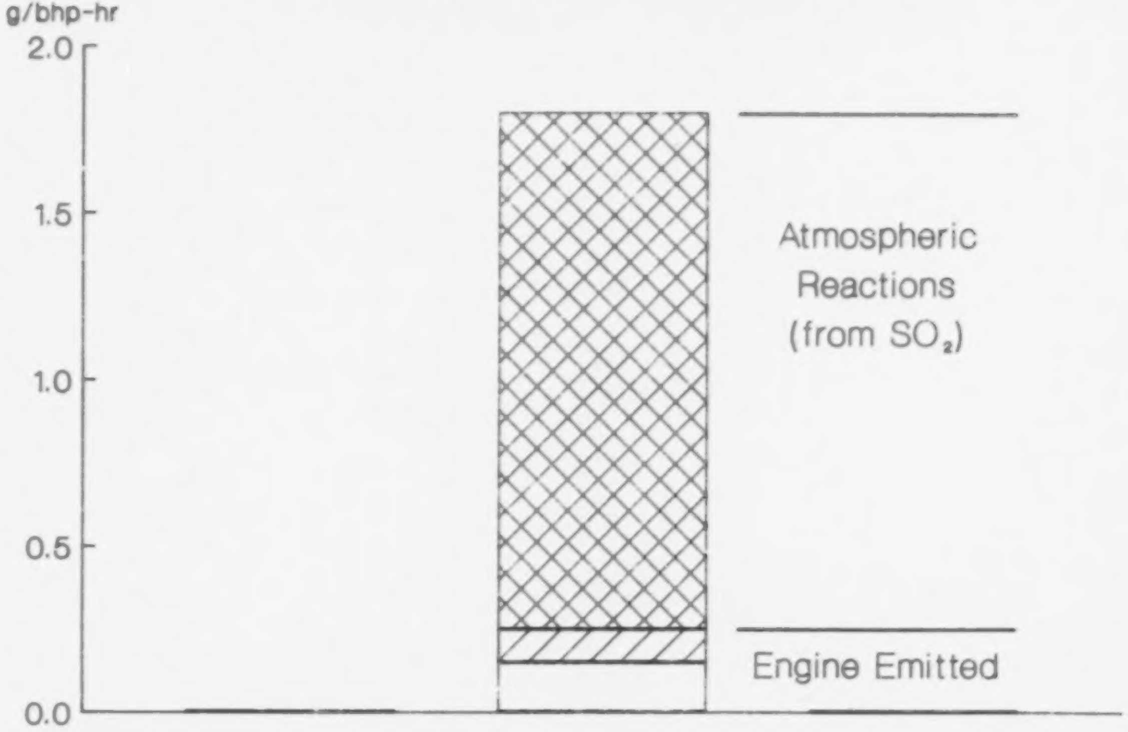
Mr. **Wall.** Because of the sulfate contribution to the particulate, the total hydrocarbon contribution from fuel and lubricant must be reduced for 1991 heavy duty engines to the current level of the lubricant contribution alone. This is likely to require the use of exhaust aftertreatment devices which will add substantially to the cost and complexity of the engines.

For 1991 urban bus engines and all 1994 heavy duty engines, total elimination of the hydrocarbon contribution from the fuel and the lubricant would still not allow us to meet required new engine particulate levels.

In order to meet these standards, fuel sulfur reduction is mandatory. The total impact of fuel sulfur on the atmospheric particulate burden, however, is far greater than the sulfate contribution to emitted particulate.

Figure 3 illustrates the relative magnitude of engine emitted particulate and particulate formed in the atmosphere from engine SO_2 emissions. At the level of the 1991 standard, the amount of particulate formed from engine-emitted SO_2 is six to seven times the total particulate emitted directly from the engine: carbonaceous particulate plus sulfate.

Figure 3 - **Diesel Contribution To Atmospheric Particulate**



Mr. **Wall**. All of the atmospheric sulfate falls into the under 10 micrometer range covered by the proposed PM10 standards, for which many areas are expected to be in nonattainment. The atmospheric sulfate can only be reduced by reducing fuel sulfur.

We have presented this evidence to the EPA, and it has been confirmed by the EPA staff in Ann Arbor. Furthermore, independent analyses by diesel engine manufacturers, petroleum companies, EPA and the California Air Resources Board have shown fuel sulfur control to be the most cost-effective approach to reduce diesel-derived atmospheric particulates.

Finally, I would like to turn to the related issues of durability, reliability and compliance with respect to emission control technology and, in particular, exhaust aftertreatment devices, commonly known as particulate traps. In the past six to eight years, there has been a substantial industry-wide effort to develop a viable particulate trap for use as part of our emission control strategy.

This requires the development of a totally new technology which has exhibited the typical fits and starts of any new development. The criteria for success are formidable. Among them: Durability of up to 290,000 miles in rough service, safety, reliability, and minimum impact on fuel economy. The current level of sulfur in the exhaust greatly complicates the task of developing an effective exhaust aftertreatment system.

Our industry has historically demonstrated the ability to produce solutions to emissions control requirements that not only satisfy emissions regulations but also result in generally improved performance of the product. We have not yet achieved this with exhaust aftertreatment devices, nor may we ever.

The current unreliability of this technology and added cost of operation would create strong incentives for tampering. This would produce a situation in which the technology simply would not be effective or would impose great additional costs on the public or both.

The complementary particulate control strategy we are proposing, fuel sulfur reduction for sulfate control and engine modification for carbonaceous particulate control, if implemented in time for 1991 engine certification, will distribute the responsibility for diesel particulate control in the most cost effective way and will help us to continue to serve the public by producing power units that meet the highest standards of performance and environmental responsibility.

Thank you for the opportunity to present these thoughts to you today. I will be pleased to attempt to answer any questions you might have.

Senator **Mitchell**. Thank you, Dr. Wall.

Before hearing from the next witness, I would like to recognize Senator Chafee, the former Chairman of this Subcommittee.

Senator, do you have an opening statement?

Senator **Chafee**. I do not, Mr. Chairman. Thank you very much for calling the meeting. I look forward to hearing from the witnesses. Thank you.

Senator **Mitchell**. Next we will hear from Mr. Bertelsen, Executive Director of the Manufacturers of Emission Controls Association.

STATEMENT OF BRUCE I. BERTELSEN, EXECUTIVE DIRECTOR, MANUFACTURERS OF EMISSION CONTROLS ASSOCIATION

Senator MITCHELL. Mr. Bertelsen, welcome.

Mr. BERTELSEN. Thank you very much. Good morning. MECA is pleased to have this opportunity to testify today. We are a nonprofit association of companies that manufacture various motor vehicle exhaust emission controls. Our membership includes companies with extensive experience and a proven track record in the development and application of catalytic converters and diesel particulate trap oxidizer technology.

The United States mobile source emission control program, created in 1970, when Congress established technology-forcing standards, which fostered the development of new control technology, is the most successful air quality control program in the world. Motor vehicles on the road today emit substantially less pollution than vehicles of the 1960s.

At the same time, fuel economy has nearly doubled, and vehicle performance has not suffered. Our companies are proud of the role they played in making the control program a success.

This morning, I would like to discuss briefly three areas. First, more stringent gaseous emission standards for motor vehicles; second, diesel particulate control; and third, controlling emissions from vehicles in use.

Legislation has been introduced and referred to this Subcommittee which would establish standards of 0.25 hydrocarbon and 0.4 NO_x for passenger cars while retaining the current 3.4 CO standard. While we are mindful of, and do not wish to understate, the technological challenges involved in meeting such standards, we are optimistic that with further development and refinement of well understood control technologies and with reasonable lead time, these standards are achievable.

In reaching this conclusion, we note that the final technical solutions would not simply be a better catalyst but rather a complete system with advanced catalyst designs and improved engine fuel monitoring.

As discussed in our written testimony, a number of promising approaches have been and are being developed which could achieve greater NO_x and hydrocarbon control than currently required.

Mr. Leonard mentioned that many vehicles currently certify at very low levels. We believe this is an important indication of what is being accomplished already in terms of emission control. We also agree that the greatest engineering challenge to meeting more stringent standards is maintaining the durability of the control systems in use.

We believe the prospects for developing durable systems to meet more stringent standards system are excellent. First, improvement in catalyst design either in existence or under development will make catalysts more resistant to thermal damage and contamination.

Second, utilization of such devices as multi-point fuel injection and other engine improvements will permit the catalyst to operate in a more protected environment.

Finally, trace levels of lead in unleaded gasoline is declining. This is very important because lead is the leading catalyst contaminant.

I would like to just mention briefly rodium usage. Rodium is an element used in controlling NO_x emissions from motor vehicles. Generally, using more rodium will improve NO_x control.

However, it remains an open question how much, if any, additional rodium would be necessary to meet more stringent standards. First, it is uncertain the degree to which advanced engine designs such as the increasing utilization of multi-point fuel injection will influence the amount of rodium necessary.

Second, catalyst manufacturers are working to develop improved catalyst and washcoat designs which will permit the same or a possibly a greater degree of NO_x control while using less rodium than is found in converters of new model year automobiles on the road today.

Turning to diesel particulate control, the legislation has also been referred to the subcommittee to control diesel particulate emissions from motor vehicles. Many of our companies are currently developing and refining trap oxidizer technology which has the capability of reducing up to 90 percent of the diesel particulate emissions from motor vehicles.

In passenger car application, we have over 25,000 trap equipped passenger vehicles on the road. Substantial progress is being made in the development of control systems for heavy duty trucks and buses.

While there are engineering challenges that still remain in developing trap oxidizer technology for heavy duty application we believe the progress to date has been encouraging. However, this progress will only continue if the standards requiring the controls remain in effect to create the necessary regulatory incentive to develop needed technology.

Closing very briefly, I would like to mention with regard to in-use emissions, existing emissions standards have resulted in significant reductions in emissions in-use. Indeed, each time standards were tightened, emission levels in-use have been reduced. Nevertheless, as EPA has pointed out on other occasions, a number of vehicles, for a variety of reasons, are exceeding one or more of the emissions standards they were designed to meet.

We believe that improving in-use emission control programs would have a direct and major impact on air quality. Such proposals as strengthening the existing state operated I/M emission testing programs; expanded use of emission control equipment inspection programs and prohibiting individual car owners from tampering all would reduce in-use emissions from existing vehicles.

I want to thank the committee for this opportunity to testify.

Senator MITCHELL. Thank you, Mr. Bertelsen.

We will hear next from Mr. David Doniger from the Natural Resources Defense Council, accompanied by Dr. Michael Oppenheimer.

STATEMENT OF DAVID D. DONIGER, SENIOR ATTORNEY, NATURAL RESOURCES DEFENSE COUNCIL, ON BEHALF OF THE NATIONAL CLEAN AIR COALITION, ACCOMPANIED BY DR. MICHAEL OPPENHEIMER

Senator MITCHELL. Mr. Doniger, welcome.

Mr. DONIGER. Thank you very much, Senator. I appreciate the chance to speak on this issue for the National Clean Air Coalition, which consists of more than two dozen health, environmental, labor, civic and other national organizations involved in the fight for clean air.

Even though important progress has been made under the existing law, motor vehicles remain one of the largest contributors to ozone and carbon monoxide nonattainment, to acid rain, and to toxic air pollution.

Hydrocarbons and NO_x emissions contribute to ozone violations for up to 45 areas that won't meet the present standard by the end of the year. Carbon monoxide levels are dominated by vehicle emissions and still exceed safe levels in cities which are home to tens of millions of people.

NO_x emissions contribute to violations of the current public health standard for nitrogen dioxide as well as ozone, and to acid deposition hundreds of miles downwind.

Diesel particulate emissions are already causing as many as several hundred lung cancer cases across the country and several thousand cases of other types of respiratory disease each year. Lead in gasoline still endangers tens of thousands of children, and the sulfur in diesel fuel contributes to unhealthy sulfate levels in urban areas and acid rain downwind.

As if the current situation were not bad enough, EPA will soon have to tighten the ambient standards for four of these pollutants because the most up-to-date scientific studies show that asthmatics children, and even healthy adults are harmed at much lower pollution levels than previously documented.

It is with this sense of the public health and environmental need that we review S. 300 and S. 321. In testimony I am going to give today, we are going to praise many parts of these bills, urge you to strengthen certain provisions, and suggest certain other amendments for your consideration.

Let me begin with cars and light trucks. Last year, the Coalition strongly supported the limits of S. 2203 for the three gaseous pollutants. We thought that the time had come to reorient auto emissions control to what the best cars can do, not the worst. The best cars already meet or exceed these standards even in combination.

The Coalition continues to believe there is no good reason why in the future, the rest of the new car and light truck fleet couldn't do as well. So we regret the fact that the light duty hydrocarbon, CO and NO_x standards in this year's bills are significantly relaxed over those in S. 2203 last year.

Certainly, the proposed standards for hydrocarbon and NO_x would make a major improvement in the health-endangering and acid rain-causing levels of these pollutants. But the bill would not improve the situation with carbon monoxide and doesn't press for what the technology could deliver if manufacturers were placed under the constructive pressure of standards that are genuinely technology forcing.

Last year, the Coalition urged the Committee to tighten the particulate matter emission standard for diesel cars and light trucks, and we are pleased to see that S. 300 would match the Federal particulate standard to California's, which allows only 40 percent of the particulate emissions that the Federal standard allows.

The Coalition strongly supports the extension of vehicle useful life requirements as proposed. As I said last year, to pretend that cars operate for only five years or 50,000 miles is to pretend that people live for only 35 years.

For heavy-duty engines in vehicles, we applaud the provisions of the bills that are before you. For particulate and NO_x the bills would largely rectify EPA's failure to carry out the existing mandate to set standards based on the performance of the "technological leaders." EPA's analysis of the industrys' capabilities for early and mid-nineties show that the leading truck and bus engines can meet even more protective standards than those which are proposed. Gasoline engines could have met the 1.7 gram NO_x standard already, had they not been exempted from the use of three-way catalysts by EPA.

The leading diesel engine makers have the means to better 0.1 gram particulate along with a NO_x standard perhaps as low as 3.0 grams, as compared to the 4.0 grams NO_x standard put in place by EPA. A 1.7 gram NO_x standard for diesels, we believe, is achievable by conversion to alternative fuels like methanol, and possibly even with diesel fuel by making further improvements in design of engines.

We also support several other important provisions propcsed in these bills: the removal of lead in gasoline and the removal of sulfur in diesel fuel. There is no excuse to have kids exposed to any lead any more, and the sulfur, as I said before, is also dangerous. EPA studies also show that the corrosion and wear reduction benefits of removing the sulfur would save each truck owner hundreds of dollars per year, totally apart from health and environmental benefits.

We support the proposed improvements in the inspection and maintenance program, including the inclusion of NO_x, and we also support the 90 percent pass rate for assembly line testing as proposed in S. 300.

We would like to stress our strong support for the provisions that would control fuel vapors from gasoline refueling and from evaporation. These fuels vapors are one of the largest uncontrolled contributors to the ozone smog problem, and they also contain known and suspected carcinogens. The bill's provision for the use of Stage II controls, on-board canisters on vehicles, and the rollback of fuel volitility are inexpensive and necessary to fight both smog and cancer.

One last point: We would urge you to adopt an improvement in the EPA in-use and recall program. The prospect of recalls, as others have pointed out is a very useful incentive for vehicle durability. An improvement in the current program would be to allow states to use their I/M data to trigger recalls. EPA's recall program does not get at all of the in-use vehicle problems that are out there. The State data right now is going to waste, and this is an area where we could improve the Federal program.

Thank you very much.

Senator MITCHELL. Thank you very much, Mr. Doniger.

Our final witness will be Mr. Jim Boyd, Executive Director of the California Air Resources Board. The Committee asked Mr. Boyd to cover a wider range of subjects than we did the other witnesses, so you can take a few extra minutes.

STATEMENT OF JAMES D. BOYD, EXECUTIVE OFFICER, CALIFORNIA AIR RESOURCES BOARD

Mr. BOYD. Thank you, Senator. I was getting a little nervous about the time limit and the large amount of information requested of me. Good morning, Senators of the committee. Since the early 1960s, the California Air Resources Board has been actively involved in developing and implementing methods of reducing emissions for motor vehicles as well as from other sources of pollution.

Over the years, we feel we led the nation in establishing technology forcing standards for motor vehicles that have resulted in the development of the catalytic converter, on-board computer controls and the diesel particulate trap, to name a few.

We have also pioneered the use of low volatility gasoline and vapor recovery controls for vehicle refueling.

Our program has been very effective. Smog forming hydrocarbon and oxides of nitrogen emissions from motor vehicles in the Los Angeles basin have been reduced over 40 percent over the past 15 years despite a 50 percent increase in vehicle use.

Because of this control, atmospheric ozone has been reduced. The reductions have been most dramatic in the past seven years, which is the period in which both hydrocarbons and NO_x emissions were reduced. This real world experience has led us to conclude that for areas such as Los Angeles, reductions of both hydrocarbons and NO_x emissions are needed to effect improvements in ozone.

Your invitation asked me to address our recent experience with vehicles and with fuel emission control programs. First, we are making a major effort to reduce emissions from in-use vehicles. Currently, most vehicles suffer from emissions above the design standards for the vehicles. These so-called excess emissions are caused by poorly-designed or constructed emissions control devices and by poor maintenance and by tampering.

To address the design problem, we are expanding our in-use recall testing. We believe that once manufacturers realize that the standards will be enforced, and once that occurs, that additional efforts will be spent to make more systems even more durable.

We rely on the vehicle inspection and maintenance program to reduce tampering and improve maintenance by vehicle owners. We have recently completed an in-depth review of our I/M program, which is now three years old. Our program features stringent emissions standards, a comprehensive testing inspection, and computerized testing.

In design, we believe it is one of the best in the country. Our evaluation of the program has shown that the program was reducing vehicle emissions of hydrocarbon and CO by 11 percent. This makes it one of the most effective control measures we have in our state in terms of tons of pollution reduced.

We also found, however, a number of problems which, if remedied, would double the emissions benefits. First, more enforcement is needed to assure that inspections, in particular, the subjective inspection for tampering, are performed properly. Our mechanics know how to detect tampering, but most just don't apply the effort.

Second, most mechanics are not equipped to repair the 1980 and newer model cars. Much more training and greater use of computerized diagnostic tools are required.

Third, the limit on repair costs which many programs set at between $50 to $100 must be at least $200 for the 1980 and newer cars, and for parts which cost more to replace, the emissions warranty must be extended to 100,000 miles.

As I indicated, California has led the way in establishing stringent emission standards for new vehicles. We continually review the development of technology and increase the effectiveness of standards when feasible. The board recently adopted a 0.4 gram per mile NO_x emission standard for passenger cars and light trucks which will be effective for the 1989 model year.

We did this because it was clear to us the technology would be available and we were convinced that lower NO_x emissions would benefit ozone reductions, reduce fine and acid particulates and improve visibility in the State of California.

We have also completed a technical evaluation of a 0.25 gram per mile hydrocarbon exhaust standard for light-duty vehicles. Our staff technical conclusion is that such a standard is feasible and cost effective and will have no adverse impact on fuel economy or performance. We anticipate that our Board will consider and act on this issue next year.

We are also evaluating more stringent emission standards for gasoline-powered trucks. These standards would be based upon the application of proven passenger car emission control technology.

Nearly half of the particulate emissions from heavy trucks come from out-of-state trucks operating in California. Thus, this is one area where we must rely on the Congress and the EPA.

In 1985, we commented to EPA that a 4 gram standard for NO_x was feasible by the early 1990s. However, as you know, EPA adopted a less stringent 5.0 gram standard. Since that time, control technology has advanced substantially, and the difficulty of reducing NO_x has been lessened. By the year 2000, diesels will account for 13 percent of all NO_x emissions in California.

Thus, a standard which reflects the best possible control is necessary to continue combatting NO_x-related air quality problems in our state. The 0.1 gram heavy-duty diesel particulate standard is forcing the development of particulate traps. I think as you know, Mercedes Benz diesel cars have been using particulate traps in California since 1985, and prototype traps are being used on buses throughout the world.

Thus, we believe this standard can be met, provided it is clear that the standard will not be relaxed. Even with implementation of the controls discussed above, California will face worsening air pollution around the turn of the century.

This will occur because we are reaching the limit of our ability to further control gasoline and diesel engine emissions while the number of vehicles continues to increase. In order to continue to improve air quality in the next century, we are exploring innovative means of reducing vehicle emissions.

One promising approach is the use of methanol to fuel passenger cars and light trucks. Studies have shown that methanol-powered vehicles produce less than one-half the ozone of gasoline fuel vehicles. The use of methanol does not depend on the development of new technologies. The changes in the gasoline engine necessary to let it operate on methanol are felt by us to be relatively minor.

We have 600 methanol powered cars in operation today in the State of California. Several have accumulated over 100,000 miles, and as you heard today, Ford has also developed a vehicle which can operate on any combination of methanol and gasoline, and as we heard earlier this week, Chrysler is working on similar developments, a so-called gasoline tolerant methanol vehicle.

This type of vehicle will facilitate the introduction of methanol vehicles until methanol is widely available. A bill has been introduced in the California legislature to require manufacturers to offer methanol vehicles for sale beginning in the early 1990s in California.

Methanol can also be used in diesel bus and truck engines, but the design changes are somewhat more extensive. The 1991 emission standards for new buses have elevated interest in methanol buses. I think perhaps you know two methanol buses have been operating outside the City of San Francisco for several years and 33 more have been ordered for use in the Los Angeles area.

It is likely that manufacturers will offer methanol buses as a preferred way of meeting the 1991 EPA bus emission standards. There is no doubt it will take several decades to complete a transition to methanol. However, other fuel modifications which will lower emissions can be made now. These modifications are particularly effective because the cleaner fuel can be used immediately by the entire vehicle fleet.

One of the most effective changes is to limit fuel volitility. Low volitility gasoline has been required during California's smog season since the early 1970s. Hydrocarbon emissions have been reduced by 75 tons per day, a 6 percent reduction in the Los Angeles basin alone.

The cost of doing this is one cent per gallon. Combined with refueling emission controls at service stations, the total reduction in hydrocarbon emissions is 280 tons per day, or approximately 20 percent of the entire inventory for the Los Angeles basin.

Another fuel control we have adopted is low sulfur diesel fuel, about which you have heard a lot this morning. By removing most of the sulfur from diesel fuel, the amount of particulate matter in the atmosphere is reduced.

In addition to benefitting public health, visibility is improved, and we feel very strongly that particulate traps used on diesel trucks will have a longer life. The cost is estimated at about 5 cents per gallon.

Mr. Chairman, that concludes my remarks, and I appreciate the opportunity to take a little extra time. I have submitted substantial additional written testimony to you.

Senator MITCHELL. Thank you very much, Mr. Boyd.

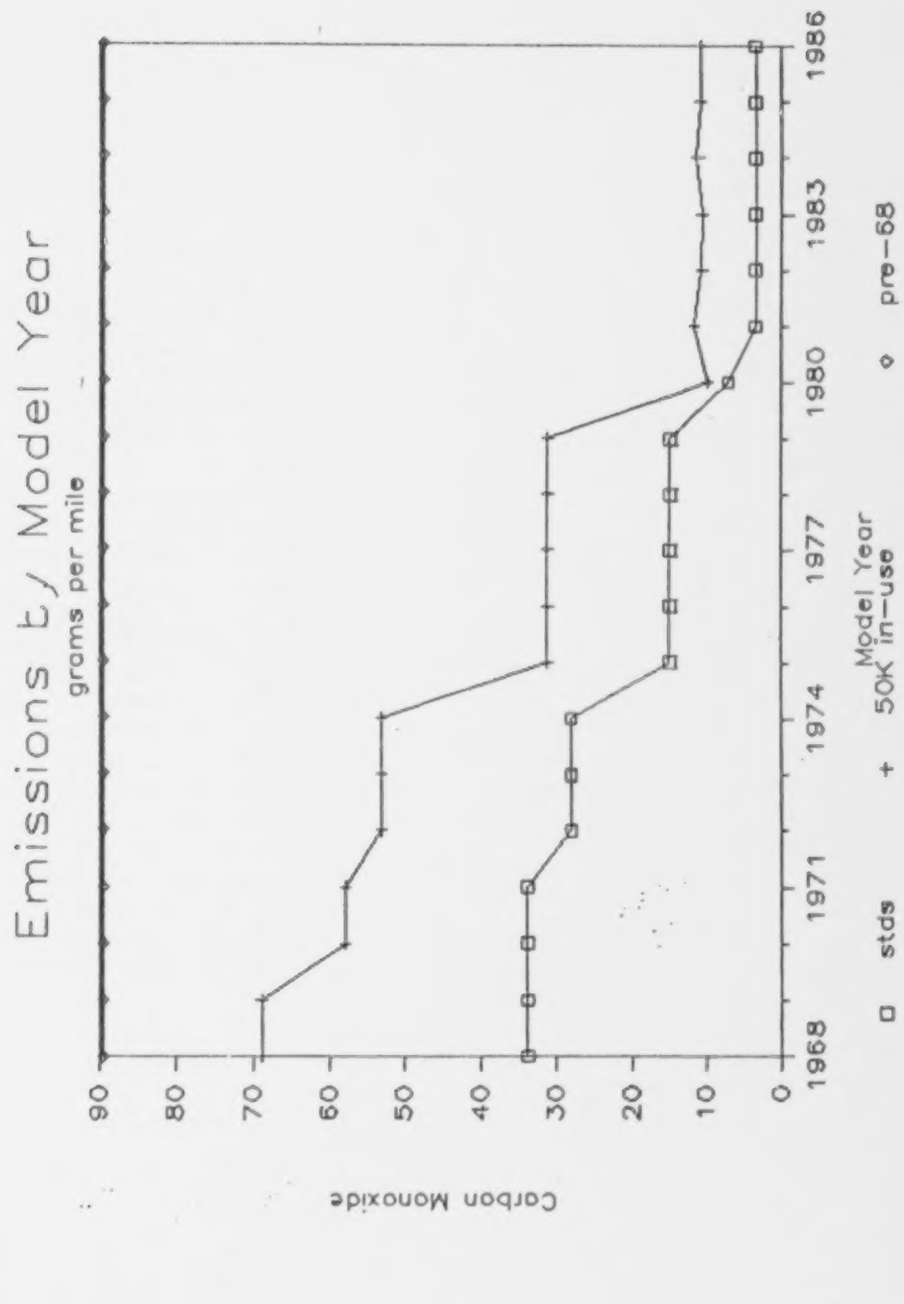
We will now proceed to questioning. This is obviously a very difficult issue for all concerned. In preparation for this hearing, I have reviewed the record of previous hearings on this same subject, and with all due respect to the manufacturers, it is truly striking, the similarity indeed, the almost total identical language used by the industry over and over again in connection with legislation proposed under the Clean Air Act.

On August 29, 1970, Thomas Mann, the President of the Automobile Manufacturers Association, submitted to this Committee testimony in writing which said, in parts, and I won't read it all, because it is quite lengthy:

> It seems doubtful legislative policy for Congress to set mandatory emission control standards by specific deadlines. It presently appears that it will simply not be possible for vehicle manufacturers to achieve the control levels specified in the bill with any fossil fuel-burned engine. All technology known to the automobile industry indicates this to be the fact.

Of course, we all know now that passage of the legislation forced the technology and significant compliance has been achieved. I have handed out to you a copy of a chart prepared by a consultant for the committee entitled "Emissions by Model Year," grams per mile, in which one line sets forth the changing and reduced Federal standards, and the other the in-use results at 50,000 miles. At every step of the way, the industry resisted change in standards in language similar to and, as I said, almost identical to that which was heard today. I say respectfully, because I was not here during all the prior hearings and discussion on this, it is very hard to draw a conclusion other than that industry just doesn't want to do anything and just repeatedly comes back with the same statements, "We can't do it. We can't do it, We can't do it, and even if we could, the benefit isn't worth the cost."

[The chart referred to follows:]


Emissions by Model Year
grams per mile
Carbon Monoxide
90
80
70
60
50
40
30
20
10
0
1968
1971
1974
1977
1980
1983
1986
Model Year
□ stds
+ 50K in-use
◇ pre-68

Senator MITCHELL. How do you respond to this? What do you say to someone who has reviewed this record and sees this document which shows that at every stage, the industry took the same position and, in fact, the standard was lowered and the result was reduced emissions? How do you persuade us not to be highly skeptical as to the testimony you have submitted to us here today, and I recognize you individuals probably are not the ones who testified in 1965 and 1970 and each of the succeeding years, but you are representing an institution, as we are, as well.

What is your response to that? What would you think if you were sitting where we are sitting? Why don't you start, Mr. Leonard, and then we will go to Mr. Padgham and anybody else who would like to comment.

Mr. LEONARD. You referenced the 1970 testimony. If that was in respect to the 1975 standards, that were then being considered, the comments were that we couldn't meet it with technology known at that time.

If you remember the history of the Clean Air Act, those standards are what is now the 1981 standards. We eventually did meet it, yes, but not with technology known at the time that this body was trying to impose those standards.

The other thing that you will note and some of this is manufacturer-related; some of it is not; the in-use levels have not generally met the standard. That is an indication of the difficulty of meeting the standards in-use. That is what we try, we are legally required to do, and that is what we measure whether we can meet the standard or not in the responses that we give you.

Yes, we have made progress. We have made the best progress, I think, of any industry in the world in reducing emissions.

Senator MITCHELL. But over your repeated opposition.

Mr. LEONARD. Primarily over the repeated opposition of the pace of the technology-forcing levels. That has been the primary opposition. Under the technology-forcing aspect of this Act, generally, the standards you are imposing are technology-forcing. The knowledge is not known on how to do them. The questions we are getting into now with the levels that we are at today, where we are at 96 and 97 percent reduction, is whether any more reductions are necessary.

We are talking down in the very mud and measurement ability, let alone the controlability I will pass it on.

Senator MITCHELL. Go ahead in any order you would like to speak. Mr. Padgham, go ahead. Mr. Buist, we will hear from you right after him. Okay, Mr. Padgham.

Mr. PADGHAM. Given your perspectivee sitting where you are sitting, I guess I would come to the same conclusion. But I guess I would like to add a few thoughts there. First, those standards were technology-forcing, as Mr. Leonard said. We were not able to meet them on the original schedule, and I am sure some of you have to remember the testimony that was set forth on the catalyst technology. That was a major break-through. I don't think anybody would argue with that. It did not come easy, and quite frankly, I don't think any of us thought that you could commercialize catalyst technology the way it has been.

I would like also to mention in terms of technology forcing, we are a divided industry by law. We are not able to work together on new catalyst technology or new emission control technology. I would like to cite an example of that as a frustration that we at Chrysler are suffering. In 1985, when the discussion was being held in California on the 0.4 NO_x standard, we were told by the Air Resources Board staff that it was new catalyst technology which was much more effective.

At the workshops and at the hearing, we as a company had asked for information that would lead us to that technology. Because of confidentiality reasons with the vendors that they were working with at the time, we were not able to find out that information.

We have contacted every catalyst vendor that exists in the world and asked, 'Where is this new catalyst technology?' We have seen none forthcoming. I hear this morning from Mr. Bertelsen, by the way, there is more of this development coming along; there is better technology. I sincerely mean this on behalf of Chrysler: If it is there, we would sure as hell like to use it.

The thing that bothers me is that we are being divided as an industry, I think, in cooperation between the major auto companies. More progress could probably be made.

Senator MITCHELL. Mr. Buist?

Mr. BUIST. Mr. Chairman, there isn't a great deal to add to the previous comments, but I would like to just make a couple of points. I was in the industry during most of this, the 1968 to 1986 period. The drop that you see from 1974 through 1975 represents a CO reduction from 39 grams to 15, a huge reduction in the standard, which was a catalyst-forcing standard in 1975, and we were paranoid about catalysts. We weren't confident we had the catalyst technology, to make the standard.

But as it turned out, we did. As it turns out, the catalyst was a fantastic piece of equipment, and it is working fantastically in use.

We needed the proof for that; we didn't have it. We were paranoid about it. That was in part, a lot of the reason why you heard through those previous years that we didn't know how to do it. Now we are at a 3.4 CO standard, that last drop that you see going from 1979 to 1981.

We are now, as Mr. Leonard indicated, talking about the remaining 4 percent of CO control. We are at 96 percent CO control on passenger cars. I assume this chart represents passenger cars.

When you start to talk about the remaining 4 percent and what you can do with that remaining 4 percent and you indicate we have to do something with it through a period of 10,000 miles or ten years, again, we are paranoid. We don't know how to do it. I have to honestly say to you at this point, we don't know how to do it.

Senator MITCHELL. I don't think anyone questions your good faith in the statements made at the time they were made. Indeed, if any person came along and just listened to the statements at any point in time with no knowledge of the prior events, they would be extremely persuasive.

The problem is that when one then views the statements in the context of what has actually occurred, it is not a question of challenging anyone's good faith, but it is and does raise the question as to the intensity of the search for improvements, whether it will occur in the absence of legislation compelling.

It seems to me the record is very strongly suggestive of the conclusion that it was the enactment of the law which was the impetus behind the developments which have occurred. You are quite correct. Obviously, as you get closer to 100 percent, that history becomes less relevant, and the question really is: Have you reached the point where nothing more is possible?

That is what is troubling to me, because on the other hand, we hear the dimensions of the problem described in very great detail, and it is a severe problem. I don't think anybody disputes that.

Mr. Leonard, go ahead. My time is almost up in this round, so I would like to go to Senator Chafee.

Mr. **Leonard**. One of the things that we had, even back in those times, was the hope of a major new technology. We were fearful of it, but there was hope for major new technology in the 1971 to 1974 frame; at least catalyst development was going on. The catalyst brought hope, some hope of technology. but we were concerned about it. In the 1979 time frame, we were at least working on it and aware of the closed loop control technology.

Today, we don't see a new major breakthrough in control technology on the horizon. What you are going to see is limited refinement of the current systems we have got on there, and we have had the advantage with this set of standards that they have been on the books for a long enough time. We are able to get feedback from the field. This is the first set of stable standards we have ever had. We are able to get the feedback from the field and make improvements with our current systems.

Those improvements are minor improvements. They are refinements. I don't see the dramatic reductions that some of the proposals in these bills would require.

Senator **Mitchell**. My time is up on this round. I am going to ask at the beginning of my next round of questions that any other witness respond to that same question.

Senator Chafee?

Senator **Chafee**. Mr. Padgham, one of the problems that you outlined was that you, as a company, have to work alone on this; that you cannot cooperate with your fellow American automobile manufacturers. Is that because of antitrust laws, or is the problem that each company desires the confidentiality?

Mr. **Padgham**. It is basically antitrust laws.

Senator **Chafee**. What would you say if this Congress permitted the companies to work together on emission reductions? Do you think that would be a factor, or do you think the problems of confidentiality would inevitably seep in there? Can you work with Ford and GM, for example, just taking two companies? Do you think that would be more effective?

Mr. **Padgham**. Yes. If I could give you a historical perspective on that?

Senator **Chafee**. All in a minute and a half.

Mr. **Padgham**. Back in the late seventies, as you know, Chrysler went through an unfortunate period, and during that time, we got special legal dispensation so that we could, in fact, use GM as a consultant. I was a participant in that particular process during that time. It appears to me that if you got the best brains in the industry, and I really think we have some, that if there are new technologies, and Mr. Leonard indicates that we foresee none at the moment, but I believe as a cooperative effort within the industry, I am sure you would see more progress than we can make individually.

Senator CHAFEE. What do you say to that, Mr Leonard? Would General Motors be interested in cooperating with other companies, assuming we made the required changes in the antitrust law? Would you work together with other companies?

Mr. LEONARD. We would probably work together with other companies on a limited basis. There are limits to confidential material, but yes.

Senator CHAFEE. Do you think it would help you?

Mr. LEONARD. Do I think it would help achieve lower emission standards than we have today? I don't think you are going to get a whole lot better than 96 percent control out of a vehicle in use.

Senator CHAFEE. It doesn't shock me to permit you folks to work together.

What do you say, Mr. Buist? Do we have that from Ford? We are giving you a lot of authority today, each of you. Speak up for your companies.

Mr. BUIST. I pretty much agree with Mr. Leonard. I think it would help somewhat. In some respects, we do work together. We are all members of the Motor Vehicle Manufacturers Association. To the extent that we can get together in that arena, we do.

Senator CHAFEE. Is the chilling hand of the antitrust laws hovering over you when you talk to others?

Mr. BUIST. No. To some extent, antitrust laws come into the picture. But you have to understand, also, that we are in a highly competitive business. I mean, we are pretty dramatic competitors here.

Senator CHAFEE. I have a suspicion that the competitiveness factor is greater than the antitrust chilling factor. Am I wrong?

Mr. BUIST. There is no question that it comes into the equation.

Senator CHAFEE. With that solid answer I will go on.

I am curious as to the California situation. We have had testimony here of very dramatic results in the Los Angeles area. You are all obviously meeting those standards. The California standards, I have got them here in front of me, and they give you a break on the carbon monoxide, but NO_x is much lower. How do you do that?

I will ask you, Mr. Leonard. You are at GM. You obviously meet California standards.

Mr. LEONARD. Carbon monoxide for California is 7. The NO_x is 0.7. It is three-tenths lower, 30 percent lower. We, as I point out in my testimony, the smaller engine is going to be easier to control. For the four cylinder engines, generally, we certify a nationwide family. We feel that we are able to achieve those levels simultaneously for the four cylinder engines.

For the six cylinder engines, we have one engine, I think, that is certified nationwide; we have one that is not. None of our eight-cylinder engines are certified nationwide. We calibrate them differently. We calibrate them slightly richer in California to get the NO_x controls, slightly leaner in the rest of the nation to get the CO control.

Now, there is definite disadvantages to manufacturing two different systems; therefore, there are definite reasons why we do it. To try to make a nationwide family out of those larger vehicles, obviously, would have some compromises in driveability or risk of recall.

Senator CHAFEE. A quick question.

Yes, Mr. Doniger?

Mr. DONIGER. Mr. Chafee, there is a point in Mr. Leonard's response, I think, to be drawn out: That a very large percentage of the vehicles are certified to meet the California and the Federal standard simultaneously, and that means they get the low CO number and the low NO_x number simultaneously.

Senator CHAFEE. Is that right, Mr. Leonard?

Mr. LEONARD. Generally, our four-cylinder engines are certified in both areas.

Senator CHAFEE. You keep referring to the four cylinder. I suppose my time is up, but what percentage of your automobiles are four cylinders?

Mr. LEONARD. I would have to get back to you on that one. I don't have that in memory.

Senator CHAFEE. Thank you, Mr. Chairman.

Senator MITCHELL. Thank you, Senator Chafee.

Senator Durenberger?

Senator DURENBERGER. Thank you, Mr. Chairman.

The area that I would like to explore with my questions this morning might be called motor fuel emissions rather than motor vehicle emissions, and I am going to focus on the evaporation of hydrocarbons from fuel in the bulk handling system, the refueling process and from the carburetor in the engine. There are several strategies out there that could control these kinds of hydrocarbon emissions, the so-called Stage II at the pump; the on-board canister, and there is a reduction in the vapor pressure of the fuel itself.

The part of the triple play that belongs to the auto industry is the on-board canister. Thinking about the canister, it seems to me that the auto industry might make two arguments against going with a canister to capture refueling emissions: One technical, that is, that it just can't be done; the second would be that it isn't cost effective. So let me start with the technical question.

I understand you already have canisters under the hood to capture emissions from hot engines. Would anybody here argue that it is technically impossible to enlarge that canister so that it can be used to reduce refueling emissions? Isn't it a fact that it is within your technical ability to go with a larger on-board canister?

I address that to the auto industry representatives. What is the answer to that?

Mr. PADGHAM. Speaking for Chrysler, there is no argument. You are correct. But it is not an easy trip.

Senator DURENBERGER. Anyone else?

Mr. BUIST. With respect to Ford, I would agree. We are not in the situation that the chairman discussed earlier of having to say "can't do." We are not, I am not here saying it can't be done. I would agree with your position; the canister can be enlarged. However, there are problems associated with larger canisters, and it was described earlier, and it is packaging. Trying to fit that larger canister into the small vehicle is a problem.

But it is not a "can't do" situation.

Mr. **Penna**. Senator, if I may add for Toyota, one of the concerns that manufacturers of smaller vehicles have, as well, is the location of the canister. If you move that canister to the rear of the vehicle, then you have to start being concerned more about safety, fuel system integrity and it is an engineering problem.

We are not saying that it can't be done, but what we are saying is it makes the task much more difficult.

Mr. **Leonard**. For General Motors, given adequate lead time, it could be done.

Senator **Durenberger**. Okay. Let me ask the question just slightly different. If we gave you a choice of where to go, if we said you had to get another pound of hydrocarbon reduction from every car, and that is always said; we didn't tell you where to go to get it, whether to go to the tailpipe or to engine emissions or refueling emissions; we just said one more pound of reduction, where would you go? Wouldn't making a bigger canister be the best of all options?

Mr. **Padgham**. Could I clarify your question, please? Are you talking strictly on the vehicle itself?

Senator **Durenberger**. Yes.

Mr. **Padgham**. Or the vehicle process?

Senator **Durenberger**. Yes, I am saying that you have to get one more pound and you have to get it from the vehicle. The question is: Do you want to go get it from the tailpipe? Do you want to get it from refueling emissions or what? I am suggesting maybe a larger canister might, given all the other considerations, lead time, safety, and so forth, I am wondering if a larger canister isn't the best way to get one more pound or whatever we might dictate.

Mr. **Padgham**. But you are referring to real world as opposed to certification?

Senator **Durenberger**. Yes.

Mr. **Padgham**. I guess I would agree that it is probably easier, given the current state of RVP of the fuel, to go to bigger canisters. That is my response.

Senator **Durenberger**. Other reactions, gentlemen?

Mr. **Buist**. Senator, I wouldn't just go to bigger canisters. I guess if I were going to address that issue, I would also address volitility in use. It has to be a package deal.

Senator **Durenberger**. I am going to get to that.

Mr. **Buist**. I thought you would.

Senator **Durenberger**. When I have time, but thank you for that contribution.

Mr. **Leonard**. Given a choice, if I have to take it out of the automobile and with the restraints and with adequate lead time, the refueling is possible.

Senator **Durenberger**. Toyota?

Mr. **Penna**. Senator, we may differ slightly. Because of the engineering problems, we may say that tailpipe might be the way, better way for us because of the packaging design problems associated with on-board systems.

But we agree certainly with Mr. Leonard's statement. There has to be adequate lead time for either of the two.

Senator DURENBERGER. I will defer my other questions until the next round.

Senator MITCHELL. Thank you, Senator Durenberger.

I wanted to pursue what Senator Chafee asked and then what Mr. Doniger commented on.

The California standard is lower than the Federal standard with respect to hydrocarbons and NO_x. The Federal standard is lower with respect to carbon monoxide.

Do I understand your response, Mr. Leonard? You are certifying meeting both standards on your four-cylinder cars, which means that you have the lower of the figures in all three areas?

Mr. LEONARD. First, Senator, I would like to point out that the California hydrocarbon standard is not more stringent than the Federal.

Senator MITCHELL. It is the same now; you are right. It is identical.

Mr. LEONARD. It is less stringent.

Senator MITCHELL. Less stringent?

Mr. LEONARD. The California hydrocarbon standard is measured as a non methane hydrocarbon; 0.39 non methane hydrocarbon for the average vehicle is less stringent that 0.4 total hydrocarbon. But yes, to the extent you are certifying nationwide families, they are certified to meet the lowest of each.

Senator MITCHELL. The lowest of the three. Then why do you object? Since that is the standard you are now meeting with respect to certification, why do you object to that being put into the law?

Mr. LEONARD. Because I build more than four-cylinder engines, Senator. I build six-cylinder and eight-cylinder engines, and I am not sure those can make it.

Senator MITCHELL. Mr. Boyd, do you want to comment on that?

Mr. BOYD. Yes, I would, Senator.

First, over 50 percent of all the models certified for sale in California are so-called 50-State vehicles; meaning, just to elaborate on your point, that more than a majority of the cars are able to meet whatever the most stringent standard is.

Second, years ago, we opted not to increase the stringency of our CO standard because of the then trade-off between CO and NO_x and the importance of NO_x control to us.

The interesting thing that has occurred, which proves the technology-forcing aspects of keeping people's feet to the fire, which gets to your earliest question of the public health people health in California, is dependent upon technology forcing. The average in-use CO emissions, we are discovering, from late model cars in California, not only meets the California standard, but it is even less than the Federal standard.

We are getting around 2.5 grams as the in-use average for CO in California, which has led us to believe that there is some interesting synergism between our lower NO_x standard and our hydrocarbon standard which, until today, I believe was equally stringent, the choice between 0.4 and 0.39.

Something is happening there to cause us to get a benefit, which is why, frankly, we haven't run out and invested the huge effort in the rule-making process that is necessary to lower a standard. We are getting a spillover benefit, and we are taking advantage of that by looking at other standards, such as the hydrocarbon standard, we think, can be ratcheted down.

The public health of the people of California, particularly in Los Angeles—we are being assaulted to the worst air quality in the Nation—is dependent upon the great faith that we have developed in Detroit and the other areas of the nation who build, or the world who build cars, to be able to meet the challenge of technology that has been provided to them.

We have been greatly relieved for years that the challenge was met which gives us confidence that the challenge can be met in the future, which drives us, frankly, to go round and round with the gentlemen at the other end of this table about what can be done in a good-faith effort to try to get what can really be done for our people.

Senator MITCHELL. On the question which I asked earlier, and which only the industry representatives responded to, I would like to give others a chance to do it.

Mr. Bertelsen, in your written testimony, you are referring specifically to diesel particulate control. You said, and I quote:

> These advances will only continue, however, if regulatory requirements exist which develop the incentive to develop such technology.

I would like to ask you and anyone else who has not yet commented on my original question about technology forcing or keeping the feet to the fire, or however you want to describe it.

Mr. BERTELSEN. Yes, Senator. Technology-forcing standards is probably the most critical aspect, the most needed thing in terms of fostering a development of either new technology or refining the existing technology.

It is critically important to companies such as ours, which are developers of emission control technology. In order to commit the necessary resources to develop these technologies, we need firm standards in place that give us the guidance and the assurance that the products that are developed will find a market.

I think to a different degree, it is true of the auto companies, as well. Technology-forcing standards essentially help determine the priorities of research and development efforts. When you have standards in place, the response is demonstrated, I think, by such things as the emission reductions, shown on the chart that you have passed out here today.

I think another example where technology forcing standards can work is in the diesel particulate area.

Frankly, for several years, EPA was somewhat indecisive with regard to setting standards for heavy-duty vehicles. While there was a fairly clear signal sent from Congress for EPA to do something about the diesel particulate problem, for a number of years, they did not.

I saw a number of our companies, who were initially interested in developing control technologies for diesel particulates, drop out because they saw this as an unending process without a standard ever being established.

Finally, EPA has taken some action, and California as well. Now, there are standards in place. The level of technical effort, both among our companies and the engine manufactures themselves, as well as independent research facilities, has increased dramatically.

That effort will only continue if those standards are preserved. I think it is important to keep in mind that the EPA always has the option to relax or delay those standards. That is something which is obviously a very considerable concern to those who are now committed to developing technology to meet those standards.

Senator **Mitchell**. Anybody else who wants to respond to that question will have to wait until my next round, because my time is up.

I go now to Senator Chafee.

Senator **Chafee**. Thank you, Mr. Chairman. I just have a couple of questions for the automobile manufacturers, and that is, Mr. Leonard, what do you say about the statement that to use methanol would only require relatively minor changes in the engines? Let's take passenger cars, and let's start with your favorite, four cylinders.

Mr. **Leonard**. We have been working on methanol engines, and primarily in four cylinder, primarily neat methanol. We are trying to address the problems that occur. In use of methanol, to take the greatest advantage of it, you need to revise it for a higher compression ratio. We have some ring wear problem that we are still working on.

The primary problems with methanol and converting a vehicle, is, number one, the cost of the high compression ratio; number two, the cost for the rest of the vehicle in terms of making the tank corrosion-proof for methanol, making the elastimers live in methanol. Those are considerable problems, but not insurmountable on a technology basis.

Senator **Chafee**. Was it you, Mr. Boyd, that said that only minor changes were required?

Mr. **Boyd**. Yes, Senator. That was in my statement.

Senator **Chafee**. Could you rebut what he said? He said it is just more than the higher compression; it is the problems with the tank, the corrosion and the problems. What do you say to that?

Mr. **Boyd**. I would not disagree with anything he said, but I characterize those as technical modifications. I am driving a 1984 Ford Escort that is methanol-powered, and have been for several years. It utilizes fuel injection and it has all the changes necessary. It is a research vehicle in California, and it is unique because it is a research vehicle. But in production, I think some of these changes might cost between $50 to $200 a car, plus Ford has testified today that it is making a car that is either going to take any kind of a fuel, and they are intending, they are hoping that we buy quite a few of those in California.

Senator **Chafee**. What do you say to that, Mr. Buist?

Mr. **Buist**. You have to understand that the vehicles that are in California. When I spoke of 600-plus dedicated methanol vehicles, those are research vehicles. Those are hand-built vehicles from our research activity, the activity that is the farthest away from production of any development activity in our company.

Now, it is true; we have got a pretty good handle on dedicated methanol technology, but we are not completely there yet from a production point of view. We need some more time.

Senator CHAFEE. Let's say you get there. Will methanol provide reductions in emissions to the extent that has been indicated?

Mr. BUIST. It appears methanol definitely is far less reactive in the atmosphere than gasoline fuel, and it appears that yes, you will see a good reduction in VOC as a result of methanol.

Senator CHAFEE. What is your comment on Mr. Boyd's price estimates of $50 to $200 per car?

Mr. BUIST. That remains to be seen. We are, as I indicated, supplying to Mr. Boyd's activity essentially hand-built prototype vehicles. They are expensive

The vehicles he has received are very expensive vehicles. Whether we can get the price, once we get into production, in larger volumes, down to the area he is talking about, which I think he said $50 to $200 is questionable. I don't know the answer to that at this point. That seems low.

Senator CHAFEE. It seems low. Does it seem to require quite a few changes? We have heard Mr. Leonard talk about gas tanks, for example.

Mr. BUIST. It requires complete modification, essentially. Methanol is a very corrosive fuel. It requires a complete modification of the fuel system from the gasoline tank all the way forward to take care of the corrosive atmosphere.

Senator CHAFEE. Mr. Chairman, that is all I have. Thank you.

Senator MITCHELL. Thank you, Senator Chafee.

Senator Durenberger.

Senator DURENBERGER. Along the line I began with, we covered the technical with a couple of questions, and I really appreciate the directness of the response.

Now I would like to go to cost effectiveness. I am assuming that the principal argument that might be advanced against on-board canisters by the industry is that ozone pollution is a regional kind of a problem; that is, that it only occurs in some parts of the country whereas the notion of an on-board canister is a national strategy if we are going to do it in any kind of a cost effective manner.

In your view, would it be much more cost effective to go with Stage II in the nonattainment regions than to go nationwide with canisters? Would that statement go with Stage II in nonattainment rather than nationwide with canisters? Would that represent a fair statement of the auto industry's position?

Mr. BUIST. Yes. We would agree with that. We think the numbers are dramatically different, the cost benefits of on-board versus Stage II. Stage II would be a far less expensive approach to take in the nonattainment areas than to ask the auto manufacturers to build all their vehicles with on-board systems.

A point I would like to make with regard to Stage II versus onboard, is the statements that were just made by Mr. Boyd. Stage II is proven technology. It has been in place in California for ten years. With respect to Ford, and I think I am speaking for General

Motors and Chrysler, also, every vehicle we build today is built to comply with Stage II. Not just the vehicles we sell in California, but the vehicles we sell in all 50 states are designed to take Stage II nozzles.

Senator **Durenberger**. I only have so much time. Is there any disagreement on that as sort of a statement of the auto industry's position?

Mr. **Padgham**. I would just like to add to what Mr. Buist has said, and that is the difference between the real impact on air quality with time. It takes sometimes 15 years to roll over the inventory of vehicles that are out there, whereas Stage II—and you can argue about how long it takes to put it in—is something like a two- to four-year lead time to implement and put in the Stage II equipment.

So if you are looking at air quality you get more bang for the buck quicker if you go with Stage II, although ultimately, they are both about the same in terms of the overall control effectiveness.

Senator **Durenberger**. Let me ask a related question and then see if we can get the balance of responses. I would take the position that ozone, like acid rain, which is more famous today than ozone is, is a transboundary pollutant.

I know in my State of Minnesota, we are in attainment with the ozone standard, so that I don't have any service station people who are jumping up and down about Stage II.

But right next door is the State of Wisconsin, and Wisconsin is not in attainment, and Bill Proxmire, who is a famous Senator from Wisconsin, has the GAO doing a study to find out where the ozone in Wisconsin comes from, and I know what the GAO is going to say. They are going to say that it comes from Minnesota; they are not in attainment in Wisconsin because they are taking our pollution.

So based on our hearing so far, it strikes me that we are going to have to do more in the attainment areas to reduce emissions that move into nonattainment areas if we are ever going to reach ozone attainment for the whole country.

Let me just ask you: Who would argue with the notion that ozone is a transboundary problem and that in many of our nonattainment areas, ozone is moving in from other regions? Would anybody argue with that?

Mr. **Buist**. No, Senator, I would not argue with that.

If you are addressing the issue of vapor control from an ozone perspective, and EPA testified to this effect last month, EPA indicates that volitility controls are far more cost effective than either Stage II or on-board, like on the order of four times more cost effective.

In other words, you reap four times more benefits if you control volitility than if you controlled on-board or Stage II.

So in my mind, volitility is the first, the first step you take. Then you have to decide whether it is cost beneficial to go after on-board or Stage II.

Senator **Durenberger**. Yes?

Mr. **Oppenheimer**. Senator, I would just make two points. First of all, not only is there a broad scale geographically of an ozone problem in the eastern United States, but you can measure nonattainment values of ozone even in rural areas, over 100 miles from urban areas.

Second, even in areas where you don't measure nonattainment values of ozone, there will be welfare effects, such as the broadscale damage to forests that have been observed in the eastern United States. So it ought to be used as a geographically broadly distributed one.

Senator **Durenberger**. This is the tag-on to the last 20 seconds. What about the crop/forest damage argument? What are your views on whether or not some of the losses in agricultural areas are due to ozone pollution?

Mr. **Leonard**. I think the studies there are confusing at this stage. I think you need a lot more data on that, and you have studies that go down to zero ozone to make some kind of comparison of what the losses are when you do not have a zero ozone level even in the absence of manmade emissions.

The conclusions you draw on the basis of that study and the effects of crop losses need to be examined carefully.

Mr. **Boyd**. Senator, if I might, I won't take time to answer the question, but I will volunteer to send you all of the material from my board meeting this last month which was dedicated to the effect of ozone on vegetation and crops, and they are fairly significant.

Senator **Durenberger**. I would appreciate it.

Thank you, Mr. Chairman.

Senator **Mitchell**. Thank you, Senator.

Senator Pressler?

Senator **Pressler**. Yes. I was just looking at the chart of Mr. Samuel Leonard's presentation here, and Figure 7-1 about the different years, "Comparison of Vehicle Age, Miles Traveled and Emissions". What does that chart mean? Does it mean that the newer cars are clearly polluting less? I can't quite figure out where the miles traveled come in. Does it mean that newer cars are putting less pollution out?

Mr. **Leonard**. Newer cars are traveling roughly 70 percent of the vehicle miles traveled. This is data from a California study under their I/M programs. Newer cars are traveling 70 percent of the miles and are contributing less than 30 percent of the emissions.

It was meant to illustrate that as we get the older, higher-emitting vehicles off the streets, you are going to have dramatic improvements in emissions.

For example, if you look at the vehicles that are pre-1975 that contribute only 10 percent of the VMT, they generally contribute about 30 to 40 percent of the emissions in the air.

Senator **Pressler**. I see. Maybe they will get off the road by attrition?

Mr. **Leonard**. By attrition, that is correct.

Senator **Pressler**. Let me ask you this: What would we have to do to get to a methanol fuel vehicle? How long would you predict it would take for—and you can comment on this—how long would you predict it would take for you to have these vehicles on the market, ones that could burn either methanol or gasoline? Does anybody want to make a prediction if you really made an effort? Could you do it next year?

Mr. **Buist**. I can address that, Senator. We have indicated that you have to answer that question in relation to a starting point. And we have to establish a starting point. It has to be established by regulation. Once a regulation is established, we have indicated that given four to five years' lead time, we could have at least one model methanol vehicle ready for production.

Senator **Pressler**. Does anybody else have a comment? Could you go faster or slower?

Mr. **Leonard**. Senator Pressler, I believe ours would be, since we are a little bit behind on the flexible or variable fuel vehicles, we call them, our program on that would have to be hurried to make a five-year schedule. We might be able to make a neat methanol vehicle in that programmed time frame.

At this stage, we think there are many, many questions that still remain before the desire to go with methanol fuel vehicles should be solidified and made a requirement. There are still significant cost differences between methanol and gasoline as a fuel. If you are looking at it as a emission control device to go to methanol fuel, there are still not only cost problems on a cost per ton basis as a cost differential between the two fuels, there is also significant question as to how much benefit methanol vehicles are going to produce.

There is a big question. True methanol is less reactive than hydrocarbons, but formaldehyde, methanol exhausts are highly reactive and can offset any type of gains you get from the lower reactivity of methanol.

These questions are still open. Not only do we not have agreement yet from my own internal scientists of what the benefit of a methanol vehicle would be to present here, but it could be anywhere from nothing to an appreciable amount.

But right now, until you resolve how much methanol is there and how much formaldehyde is there, how well you control the formaldehyde, those are open issues, as are the other toxic effects of methanol. There are many issues that need to be considered in more detail before you jump in on methonal programs.

Mr. **Buist**. Senator, let me just expand for a second on my statement. I agree with what Mr. Leonard just said. One of the major concerns we have with any methanol program is the availability of fuel.

It obviously would be a dramatic mistake for a manufacturer to start production of methanol vehicles without some guarantee that the fuel would be there for the customer to use when he buys the vehicle.

If we have learned anything out of California methanol fleets, it is when people start to drive dedicated methanol vehicles, they become absolutely paranoid about fuel supply. They won't venture much beyond two or three blocks from their house unless you can assure them when they get out there, there will be methanol fuel available.

So the fuel supply has to absolutely be there. At today's gasoline prices, something has to be there to make it available, and that is competitive pricing.

Senator **Pressler**. Even if you had the vehicle, the fuel supply, your point is the whole structure.

Mr. **Buist**. The whole infrastructure has to be there.

Senator **Pressler**. Let me say, on the down side, as far as you know, will a car burning methanol create some new type of environmental problem we don't know about?

Mr. **Leonard**. Senator, before I address that question, you asked a question before of how soon. General Motors does have a program in place trying to put in a methanol engine available on production for urban buses as early as 1991.

With respect to the other environmental problems with methanol, I spoke of formaldehyde to some extent already There is a problem with the toxicity of methanol, and there are potential environmental problems depending upon what the source is of your methanol, where it comes from.

Some sources are relatively clean and off-shore; some sources are relatively dirty and on-shore.

Senator **Pressler**. My time is up. Can I ask one other question? Are there any environmental down sides for methanol foreseen?

Mr. **Leonard**. There is a paper on that, at least initially, which addresses it in our written statement.

Senator **Pressler**. Fine. Thank you.

Senator **Mitchell**. Thank you, Senator Pressler.

Senator Stafford.

Senator **Stafford**. Thank you, Mr. Chairman.

I am sorry that I have to be in another committee this morning, so I wasn't able to hear the statements that the witnesses have made at this hearing. We had an opportunity to examine some of the written statements, and so I would like to address my first question to Dr. Oppenheimer.

Doctor, first, is there a regional ozone problem, or is nonattainment strictly a matter of concern in a few urban areas? From the existing monitoring, can one fairly conclude that ozone is a pollutant which is fairly evenly distributed, and if so, are the levels fairly uniformly high or fairly uniformly low?

Second, if I am not asking too much at once, what is the most effective strategy for reducing ozone levels? Should hydrocarbons be reduced alone, oxides of nitrogen reduced alone, or both pollutants reduced simultaneously and, to the maximum extent marketably proportionate?

Finally, even though we measure ozone nonattainment, does that mean that reductions should be focused only in urban areas, as well? In other words, are pollutants which originate in rural areas contributing perhaps substantially to urban nonattainment? I realize that is a triple-barreled question.

Mr. **Oppenheimer**. That is okay, Senator. I wrote them down. I think I can answer them in order.

First of all, as we discussed here earlier, there is a regional ozone problem. Ozone levels are high in non-urban areas and, in fact, violation to the standards are observed quite a distance from cities, up to at least 100 miles from any central urban area in cases that I know of.

There is a broad situation with elevated ozone levels all over the eastern United States. Background levels are about 30 parts per billion, and observed levels, the observed monthly di maxima can be as high as 90 parts per billion. That is a monthly mean maximum. That means that occasionally, you are certainly getting nonattainment levels of ozone in those areas.

As far as the contribution, the third question, the contribution of rural ozone and precursors to the urban nonattainment problem, there is ample evidence that ozone as precursors are transported over long distances around the region and that high ozone levels and high levels of the precursor emissions in rural areas are transported into urban areas and contribute to nonattainment.

For instance, if you measure, as is the case occasionally, nonattainment levels of ozone 80 miles upwind of New York City, you can be quite sure that a little later in the day, that ozone will affect the attainment situation in New York City. Conversely, downwind from New York or any of these urban areas, all those areas are getting a big shot of ozone produced in the urban areas.

Finally, as far as strategy is concerned, based on modeling, based on the California experience mentioned earlier, the most effective course for further progress on ozone nonattainment is a combined strategy of NO_x and hydrocarbon control.

Senator STAFFORD. Thank you very much. My next question I would like to direct, Mr. Leonard, to you. Before I ask this question, let me make an observation which is that I own two cars built by General Motors, and I have been a long-time customer of General Motors, and I do believe you know how to build cars. I wondered about the design of the outside lately.

I must admit that I did have some reservations about GM's wisdom in 1977 when I believe you told the company that Ed Muskie and I were, from the viewpoint of the U.S. auto companies, Public Enemies Number One and Two.

Even that wasn't enough to cause me to buy foreign-made cars or even to switch to Ford. Having said all of that, I do have some questions about your statement.

It seems on the one hand that you paint a very bleak picture, saying not another drop less of pollution can be wrung out of cars or trucks and on the other hand, a very optimistic picture saying that people are rarely, if ever, exposed to ozone levels that could cause any adverse health effects.

In all of these cases, it seems to me your view that General Motors is right and everybody else is wrong. EPA and the States are wrong where monitors are placed. Science advisory boards are wrong in reaffirming on the carbon monoxide standard. Public health officials are wrong in estimating the health risks posed by air pollutants.

Am I being unfair, or do we simply have to recognize that General Motors is putting a face on all these facts that is most favorable to its policy views?

Mr. LEONARD. With respect to the health effects issue, you heard the testimony of the General Motors expert last week, and I did not attempt to provide any expertise with that.

I will rest on the statements that he made. I think in any argument, you take the approach it is favorable to you and use the data that is legitimate data and tell a story the best way that you can.

We sincerely believe the things that we are saying. I think the data support us, the data that we have seen. Your question got involved, but I want to thank you for your loyalty.

Yes; as any good advocate, we would present the facts and the data in the way that best support our argument. But I think that is also buttressed by fundamental support or fundamental concern for the air quality benefits that can be obtained and should be obtained.

Senator STAFFORD. I understand. Thank you, Mr. Leonard. I see my time is up.

Senator MITCHELL. Thank you, Mr. Chairman.

Mr. Leonard, I just wanted to pursue the inquiry we were engaged in in my last round. We talked about your meeting the California and Federal standards on four-cylinder cars, and you commented that you build six- and eight-cylinder cars, of course.

But you meet the California standards on those in California, do you not?

Mr. LEONARD. Yes, I do.

Senator MITCHELL. I understand that is about 17 percent of the national market?

Mr. LEONARD. It may be 17 percent of the national market. It is not 17 percent of the GM market.

Senator MITCHELL. Well, let's assume it is somewhere between 10 and 20 percent. California has about 20 percent of the Nation's population, and it is growing. I guess my question is: If you are meeting these standards, with respect to a very large substantial segment of the terms itself, why don't you do it nationally?

Mr. LEONARD. Number one, I don't think anywhere in our testimony we have said we can't do it nationwide. What I said in my statement, with respect to the 0.7 NO_x. is that there are obviously some type of impacts, be it driveabilitly or be it risk of recall that we don't want to put up to take the chance on.

Generally, I think it is the risk of the recall with the larger vehicles; that because it is so attractive to be able to build one vehicle as far as not making mistakes in the production process, that there are substantial reasons why we choose to build two vehicles, one for California and one for the rest of the nation.

There are trade-offs that we feel, in our best business judgment, we need to do that.

Senator MITCHELL. Mr. Iida, we don't want you to feel neglected here. We have been directing all of our questions at the other manufacturers. I want to ask you a question about one aspect of your statement.

On page 11, your statement says that Toyota's carbureted vehicles cannot meet the 0.41 HC 3.4 CO and 0.7 NO_x standard.

First, I would like to ask, to put that statement in proper context, am I correct that more and more engine models rely on fuel injection rather than carburetors?

Mr. IIDA. Yes.

Senator MITCHELL. So you are saying that this is taken into account. According to this statement, over 60 percent of the cars on the road, by 1993, will use fuel injection. According to our staff, an assessment of the 1987 certification test shows that Toyota the lowest NO_x and carbon monoxide emissions of all manufacturers. You are in essence meeting these standards?

Mr. **Iida**. The certification emission level is lower because we have to consider deterioration, and also that vehicles are used for many years. So we have to certify at lower levels.

Senator **Mitchell**. I will just put it this way. It seems to me that you are meeting the standard, and I am hard pressed to understand why you are complaining about it.

Mr. **Penna**. Senator, what we are saying is that for the electronically fuel injected vehicles Toyota produces, these are certified and sold in all 50 States, and that, as Mr. Leonard pointed out, is very desirable from a marketing standpoint.

The carburetored vehicles tend to be the lower priced vehicles for the entry level type of purchaser. For these vehicles, it is much tougher to meet lower standards, because carburetors are a grosser means of metering the fuel, and it is tougher to meet more stringent standards in-use with carburetored vehicles.

Again, we are not saying that we can't meet those standards. What we are saying is, we certify at a lower level to provide a cushion for margin of safety, due to production variability and in-use problems. So we definitely certify well under the standard just as any other manufacturer would.

Senator **Mitchell**. For the benefit of the record, would you identify yourself?

Mr. **Penna**. My name is Richard Penna, and I represent Toyota Motor Corporation.

Senator **Mitchell**. Thank you, Mr. Penna.

Since my time is up, I will go to Senator Durenberger.

Senator **Durenberger**. Mr. Chairman, thank you.

I think so far we have talked about the question of where should we go if we are to get some reduction, and we agreed that the canister was a good place to go. When I asked: Can we make them larger? The answer was, yes, we can make them larger. Now I would like to talk a little bit about the connection between vapor pressure of the motor fuel that is sold in the market and the on-board canister.

I have the impression that the current canisters are designed for fuels of about 9 psi, but that the fuels that are actually sold become much more volatile. It is also my understanding that if we expect canisters to play a role in reducing fuel emissions, we need to do something about vapor pressure so the capacity of the canister would be more reasonably sized.

My first question is: Is there, in fact, a connection between vapor pressure and canister technology, and should we be looking to lower vapor pressure to play a role in emission reduction?

Mr. **Buist**. Senator, as I indicated before, yes, I believe that we should be looking to volatility. EPA has indicated that if you look at volatility compared to either Stage II or on-board, it reaps four times the benefits of either of the other two. In my mind, that says that volatility is perhaps the first issue you ought to address, or EPA needs to address.

Senator **Durenberger**. I would like to get a response from the other two, if you want to. I will give you the figures that I have in my head, and I could be wrong. I said that the design of the current canister is nine pounds per square inch.

I have the impression that current vapor pressure, volatility, or whatever, is as high as 11.5. Is there a place we ought to be looking to settle in-between there somewhere or shouldn't we be looking at that as part of it?

Mr. PADGHAM. Senator, if you take into consideration all of the vehicles that are out on the road, in other words, the existing inventory, and you are looking to get the maximum benefit, you will go back to the design standard, which is nine pounds. The burden is primarily on the oil industry, how much is it going to cost them to roll back from 11.5 to 10.5 to 10 and then to 0.9. I am afraid I can't answer that question for them.

Senator DURENBERGER. Yes.

Mr. DONIGER. Speaking from the perspective of the Clean Air Coalition, what we have been seeing is a rather embarrassing process at EPA. They have three control methods, each of which works, each of which is very cheap compared to other measures that could be done to control hydrocarbons from other sources, and all three of them, we believe, ought to be applied.

One problem with relying on solely on on-board is that it takes a long time to get the benefits in the non-attainment areas because you have to wait for the new cars to be produced with the new equipment on them. In contrast, the Stage II pump controls can be put in much more quickly if the political decision to do that is made.

Mr. BOYD. I am not a good witness on this point, Senator, because California is so atypical. I just want to reiterate that we have had a nine-RVP standard in some part of California for some parts of the year since 1971, and we have started looking at eight. We also have Stage II. We are not involved in the on-board canister fight at present, certainly one of the few in which we are not, but we certainly favor the three-prong attack at least as far as our State.

Senator DURENBERGER. Let me just say Mr Chairman, on the point made by the Clean Air Coalition, I have letters from John Dingell and Lee Thomas, both of which dance around the issues of the three approaches, Stage II, vapor pressure reduction, and the on-board canister, and demonstrates that the government of this country has no willpower whatsoever to deal with these issues or to help those who have to deal with the issues. I would like them be made part of the record. (See pp. 526.)

Let me ask a question as the Stage II issue, if that is where people say we ought to be heading. I have seen a great deal of resistance to Stage II. The consumers don't like the technology because it is difficult to use. The service station owners resist it and, looked at from the perspective of their economics, it is very expensive.

I am wondering if the auto industry has done anything, to look at the design of the car itself—the gas tank, what-not—to see if there might be changes in auto design that could make Stage II systems easier to use, cheaper to use, more effective in capturing emissions?

Mr. BUIST. Senator, as I said before, we design all of our vehicles today to accommodate the California Stage II system. We don't design two different systems with respect to Stage II, so our vehicles today accommodate the Stage II system regardless of where it would be implemented.

California has a set of rules in which a manufacturer has to design the filler neck, and the entrance area around the filler neck so a Stage II nozzle to operate properly.

I think, as we look at what has happened in California over the past ten years, there is no question that there were startup problems, but those are all behind us. California would indicate also that those are all behind California, and the system is operating quite smoothly. The public has accepted it. They have gone through four, five, or six stages of development of the nozzle such that it is now a very customer-friendly system. In our opinion, things are operating pretty well in California.

Mr. BOYD. I would agree, Senator, for California.

Senator DURENBERGER. Thank you, Mr. Chairman.

Senator MITCHELL. Thank you, Senator Durenberger.

Senator Stafford.

Senator STAFFORD. Thank you, Mr. Chairman.

I have one observation/question that I would address to the entire panel.

We believe we have a problem here which is how the United States is going to reduce air pollution. Witnesses have told this committee that at the current standard for ozone there are adverse health. Up to possibly 100 million people are breathing air that is adverse to their health. Other witnesses told us that acid rain is a leading cause of lung disease in the United States, trailing only passive and active smoking. We know that some forests are dying, and some lakes are already dead, and that air pollution is the probable cause, at least in some areas, and probably many.

All of this air pollution is increasing. Ozone is increasing, so are the oxides of nitrogen, sulfur dioxide as well. They may be at this level right now, but we believe that they will be climbing again soon.

Yet you seem to be saying in your statements that every suggestion we have made on this committee, which could affect your industry, cannot or should not be done. Standards should not be tightened. The warranty period should not be extended. On-board controls should not be installed, and so on.

I guess, I ask you, are you suggesting to us that we should do nothing, and leave things as they are?

Mr. BUIST. Senator, I don't think that I am exactly saying that. I would not profess to be a health effects expert, nor would you want me to be, nor would you believe me if I said I was one.

As we look at the situation, it is clear that there is an ozone nonattainment problem in a considerable number of areas in the United States. We look at that, and then we look at ourselves and EPA guidelines that, mobile sources are responsible for about one-third of the problem. Then, we say, but we are working down in the mud, with only 4% left to control, with respect to trying to clean up the remaining portion of our contamination. Hydrocarbons are now 96 percent controlled. We have to conclude, when we look at further reductions in standards versus just letting the car park roll over, that there is very little benefit achieved versus the cost concerned, and versus the ozone impact. We conclude that if you direct your attention at us, you are not really going to reap tremendous benefits. That is really where we come out.

Senator **STAFFORD**. I can assure you that we are looking at other records, too, but you are the ones who are here this morning.

Mr. **BUIST**. Yes, you are right.

Senator **STAFFORD**. Would anybody else care to respond?

[No response.]

Senator **STAFFORD**. Does anybody take exception to Mr. Buist's statement?

[No response.]

Senator **STAFFORD**. If not, we will accept that from the panel.

Thank you, Mr. Chairman.

Senator **MITCHELL**. Thank you, Senator Stafford.

Dr. Wall, in your statement, you forcefully describe the need for lower sulfur levels in diesel fuel. Would you support legislation that would establish limits?

Dr. **WALL**. Yes, sir.

Senator **MITCHELL**. Anybody else here have an opinion on that, would you support legislation that would establish, in this case, a 0.05 percent sulfur limit in diesel fuel?

Mr. **BERTELSEN**. Senator, we would support that position, as we urged EPA in its consideration of that issue. In doing so, we think that it is also appropriate to look at the level of the standard as established. Not only will low sulfur fuel facilitate trap usage but reducing the sulfur content will help with emissions. It is appropriate to reassess the level where that standard should be in terms of technological feasibility if we are operating on the assumption of a low sulfur fuel. In terms of our development efforts, it would be very helpful to have a decision on low sulfur fuel as soon as possible so that we can gear our technology efforts to design a system that would be operating under low sulfur fuel.

We support it, and we would like to see a decision made on that very quickly. Again, we would urge that as part of that consideration, an examination be made of the standard itself to see if it should be tightened.

Mr. **DONIGER**. I would like to support those comments and point out that while it would be good from a health perspective to take the sulfur out, if the particulate standard is left where it is, the result might be to actually hinder trap-oxidizer development. The reason is that some manufacturers are pretty clear that they believe that without sulfur in fuel they would be able to meet the diesel particulate standard without using traps at all.

The diesel particulate standard is not set where it is because that is an acceptable and healthy level of diesel particulate for people to breathe. It is set there because EPA believed that level to be as far as you could go at that time. But I think that Mr. Bertelsen's point is that without the sulfur in the fuel, the total reduction in diesel particulate could be greater, and sulfur removal must not be done in such a way as to actually hurt us by undermining the incentive to work on the traps.

Senator **MITCHELL**. Dr. Wall.

Dr. **WALL**. I would like to respond briefly to those comments.

Certainly, reducing fuel sulfur would be advantageous for us in meeting particulate emissions. One, reason is because the sulfur contribution to the particulate would be reduced. On the other hand, we are not in a position of seeing that, with the sulfur reduction, we will be able to meet the 1991 limit without exhaust aftertreatment, nor certainly meet the 1994 or 1991 bus limits without exhaust aftertreatment.

One of the advantages, however, if exhaust after treatment is required, and we expect that to be the case, of having the lower sulfur fuel, is that catalytic trap technology could possibly be employed in the 1991 time frame. With catalysts in the exhaust after treatment system, it would likely simplify the technology that would be required. It is quite possible that it would improve the durability of the device.

With the current levels of fuel sulfur, because the catalyst also oxidizes the SO_2 as well as the carbon, typically you would find extremely high sulfate levels, which are sulfuric acid, in the exhaust. So you would have high sulfuric acid in the exhaust in trade for lower carbonaceous particulates. Certainly that is not a good solution.

So we feel, even though reducing sulfur would not necessarily make it possible to meet 1991 standards without exhaust after treatment, it certainly makes the possibility of having commercially applicable exhaust after treatment technology available in that time frame much more likely.

Senator MITCHELL. Does anybody else wish to make a comment on that question?

[No response.]

Senator MITCHELL. Then let me go to the issue of in-use performance and ask a few questions on that.

The 1987 certification data for the industry's prototype vehicles demonstrate that gasoline engine technology is capable of bettering existing carbon monoxide standards by 40 percent, the hydrocarbon standards by 50 percent, and the NO_x standard by 60 percent. Does this not demonstrate that the technology is available to meet or even exceed existing standards?

Mr. Leonard.

Mr. LEONARD. Senator, certification data, since 1981, has generally been 50 to 60 percent of the standards. Our experience with in-use has not been that we are beneath the standard on the broad range of our product lines. We have made improvements in industry emissions. In the first year-technology, we were relatively poor. The second year, we got better in 1983 and 1984.

The last vehicle for which there is good data enough to project up to 50,000 miles is 1985. We think that we are going to be at the standard for hydrocarbon, and slightly below the standard on average, again, for all the vehicles out there for NO_x, and maybe at the standard for CO.

But that is the average of all of the vehicles out there. Any time you have an average, it means you have a spread of vehicles above that and vehicles below that, therefore, you have a risk of recall because you have some vehicles above the standard.

Our goal is to have the average of in-use levels at 70 percent of the standardize to minimize to the absolute extent any possibility of recalls.

Senator MITCHELL. Mr. Padgham.

Mr. PADGHAM. I basically endorse what Mr. Leonard said. Our experience is very similar, whenever you change the standard. EPA put together a report about three years ago relative to the 1981 standards, and they looked at all of the in-use numbers and, basically, it stated, as Mr. Leonard said, that it would be several model years before we could generate the in-use technology that would ensure the in-use compliance.

Senator MITCHELL. I see Dr. Wall wants to comment on that also.

Dr. WALL. Yes, I would like to comment on that briefly.

Our engine is in a little bit different category. Our heavy duty engines have to certify after 290,000 miles. We have to certify that they will meet the prevailing particulate and other gaseous emission standards at the end of that period of time.

So it is not possible for us to design engines that certify at the precise level of the emission regulations, and expect that they will continue to hold that level for 290,000 miles. There are a couple of reasons for that, and one is deterioration of the engine. I think we are all familiar with the fact that engines do deteriorate. The other, which is perhaps more important for diesel engines, is simply the variability of the measurement technology that is used to measure emissions from these engines.

In the case of a recall, or an audit of our performance, we have to take into account the fact that there is going to be some statistical variation, in the emission levels of our engines as they are being measured. In addition to that, there is some statistical variation in performance because of production variability.

We have to take all of that into account in our certification targets for our design engineers to ensure that we will still meet the prevailing emission standards.

So what you are seeing is a response of the design technology to the standards, and not some accidental improvement even though we were targeting for a specific emission standard.

Senator MITCHELL. Mr. Buist.

Mr. BUIST. Senator, I think in-use becomes a complicated issue. Certification is pretty straight forward. After you finish certification, as Mr. Leonard indicated, we tend, not unlike General Motors, to certify in the area of 50 percent below the standard to assure ourselves that in-use, we will comply.

EPA tracks us very closely. They track us as our vehicles leave the assembly plant, and they track our vehicles in the hands of the consumer. The very chart that you handed out, I think is a good example of what is happening in-use. One plot is the standard, and the other plot is what is happening in-use. As you can see, the two lines are approaching each other. They are still apart, but nevertheless, they are approaching each other over time.

From an in-use perspective, there is no question that sometimes we make mistakes, sometimes components don't work the way we design them to work. When that happens, when EPA finds it, or we find it, we repair the vehicle.

Tampering and misfueling, EPA indicates to the extent of 20 percent, still exists. A single tampered or misfueled vehicle emissions, can be equivalent to five or six, or as many as ten other vehicles. So one misfueled or tampered vehicle dramatically increases the average. But we see that decreasing. EPA data indicate that it is coming down slowly, but nevertheless it is coming down.

We are proud of this chart. We think that it shows success. We are not home yet, but we are well on our way.

Senator MITCHELL. It shows success because the standards have been tightened over your opposition. This reminds me of President Reagan. The President proposed that we abolish Federal funding to build senior citizen housing. When that was rejected by the Congress, he went to Buffalo, with great publicity, to dedicate a new senior citizen home.

I appreciate your comment, and there is reason to be proud, but it is hard not to escape the impression that if we don't have tight national standards nothing would happen. Really, it is very difficult, given the record and Mr. Bertelsen's statement, you have to have this pressure to induce a response.

Dr. WALL. Could I comment on that?

Senator MITCHELL. Senator Stafford did have another question, so why don't I defer to him, and then you can respond as well.

Senator STAFFORD. Thank you, Mr. Chairman.

Let me address this question to all three or all four of the manufacturers who are represented here.

When in-use data is analyzed, it shows that CO and hydrocarbon emissions rates do, indeed, go up with use, but NO_x emissions do not, at least as rapidly. It is about 70,000 miles before NO_x emissions violate the 1.0 standard, assuming proper maintenance.

So my question is: Why is it that NO_x in-use performance is so much better than ther other two, that is CO and hydrocarbon?

Mr. PADGHAM. If I can address this, speaking specifically for Chrysler, that is not our experience.

Senator STAFFORD. That is not your experience?

Mr. PADGHAM. Certainly not.

Senator STAFFORD. What has your experience been?

Mr. PADGHAM. Our experience has been, looking at the one gram NO_x standard, and 0.7 gram NO_x standard in California, what we have experienced is that you are relying on the catalyst more, and as the catalyst ages so does the NO_x level increases.

Senator STAFFORD. Do you have any comment, Mr. Leonard?

Mr. LEONARD. Historically, prior to 1981, hydrocarbon and CO were catalyst controlled, and NO_x was not. Even with current vehicles, some of the control still remains with the engine gas recirculation which tends not to deteriorate, whereas virtually all the controls for hydrocarbon and CO are catalyst controls. We are still not at the point where we want to be for in-use for NO_x for the one gram standard.

Mr. BUIST. As I recall, Senator, thinking back through a lot of certification programs, I recall that NO_x deterioration was not as great as hydrocarbon and CO. I am not sure if that is the case in-use. I would have to go back and look at EPA'S in-use data, and see whether, from our perspective, it would appear to be the numbers that you just listed.

Senator STAFFORD. What about Toyota?

Mr. IIDA. We cannot answer at this time. We will have to provide it for the record.

Mr. **Penna**. Senator, we will provide that for the record. The same as Mr. Buist, we have to look at the comparison.

Senator **Stafford**. If any of the manufacturers care to submit a response in writing, that would be fine.

[The following was subsequently supplied:]

CHRYSLER
MOTORS

Chrysler Motors Corporation

May 1, 1987

Senator Robert T. Stafford
Washington, D.C. 20510

Dear Senator:

Chrysler appreciated the opportunity to testify before the Subcommittee on Environmental Protection on April 9, 1987 at the hearing on "Potential Additional Controls of Mobile Sources Under the Clean Air Act."

During the course of that hearing, you asked the auto manufacturers to comment on a question you raised:

> "When in-use data is analyzed, it shows that CO and hydrocarbon emissions rates do, indeed, go up with use, but NO_x emissions do not, at least as rapidly. It is about 70,000 miles before NO_x emissions violate the 1.0 standard, assuming proper maintenance.
>
> So my question is: Why is it that NO_x in-use performance is so much better than the other two, that is CO and hydrocarbon?"

My response at the hearing noted that Chrysler's experience with deterioration factors of emission control systems is not consistent with your information, and that the rate of increase of NO_x emissions with time and miles is generally of the same magnitude as for HC and CO.

In response to your invitation to submit an answer to your question in writing, I would like to add the following:

o There is a general trend in increasing tailpipe NO_x emissions with mileage on late model vehicles. Factors which contribute to this include the normal deterioration with miles of the catalyst, fuel control and EGR (exhaust gas recirculation) systems. These factors more than offset any reduction in engine-out NO_x levels resulting from items such as a decrease in engine friction.

Detroit MI 48288-1118

Page 2
Senator Stafford

- A major factor in the increase in NO_x emissions is the recent greater reliance being placed on catalysts to reduce NO_x in relation to the role of EGR systems. EGR deteriorates at a lower rate than catalysts, but today's stricter NO_x standards exceed the capacity of EGR systems and cause us to use catalysts more than in past years to control NO_x.
- While this increasing NO_x trend is representative of what occurs with the typical vehicle which has been properly maintained, it is conceivable that NO_x emissions could decrease with miles if the fuel control shifts in the rich direction because of a contaminated O_2 sensor or deterioration of another fuel system component. This would be associated with a signifiant increase in HC and CO emissions deterioration.

I believe this additional information will help you to understand the problem we would face in meeting the stricter NO_x standards which have been suggested in discussions on various proposed amendments to the Clean Air Act.

Please let me know if you have any further questions on this issue.

Attached to this letter is a corrected copy of the transcript, marked up in red, with the involved pages identified by paper clips.

Sincerely,

H. B. Padgham

H. B. Padgham, Chief Engineer
Powertrain Engineering Programs

HBP:sh
Attachment

GEA/CWE#3

Senator **Stafford**. I listened to Dr. Wall describe his engine that has to be prepared to go 290,000 miles. I will have to say again, Mr Leonard, I have a GM diesel vehicle of my own, and I hope that it will last me 290,000 miles.

Dr. **Wall**. Senator, if you have room for a 14-liter diesel engine that runs 300 horsepower, we might be able to fix you up.

Senator **Stafford**. I will keep that in mind.

Senator **Mitchell**. I would like to get back to the question of in-use performance, and the obvious gap between certification and what actually occurs in-use. We had some comments on that earlier, and ask a question.

What steps can be taken to close that gap? Mr. Boyd, I would like to ask you to begin with the response because there has been some experience in California, and then if anybody else would like to respond.

Mr. **Boyd**. Thank you, Senator.

I would make one comment. Even we have reached the conclusion that when you get to 3.4 CO, 0.25 HC, and 0.4 NO_x, we are terribly hard pressed to push much farther until this durability issue is resolved. We have identified it frankly as one number one priority issue, and I am encouraged to hear the manufacturers say that they agree. This is something that we are trying to pursue, and I hope that we can work together on it.

As I said in my testimony, what we are doing to address it is to increase our enforcement activity in the in-use area. Our legislature provided more resources to put more people in the field to engage in more testing and checking of vehicles, and we intend to use the recall power, which I think we have heard earlier today is somewhat anathema to Detroit, if necessary to bring about what we feel are either design or manufacturing deficiencies to cause the systems to be more durable, while at the same time pushing our inspection and maintenance program to its ultimate capability to also address the real dilemma of mal-maintenance and tampering by the vehicle owners.

We have roughly a 50/50 problem between the owners and drivers of vehicles and the manufacturers, and we, in California, hope to take these steps to do both. With respect to manufacturers, it will be to push them harder with our enforcement power to, hopefully, solve the problem.

Senator **Mitchell**. Mr. Leonard.

Mr. **Leonard**. First, Senator, I don't think that the certification process can ever duplicate the vehicle operation we see in real life. You are never going to get exactly the same values in certification that you are going to get in-use by definition.

The certification process is a simulation of the average vehicle usage in the field. It is compressed, by necessity of leadtime, from a five or more year process down to an accelerated process that may last six to 18 months. So you are never going to be able to eliminate the difference between what you see in certification and what you see in use.

With respect to actual in-use emissions, and how you improve in-use emissions, recognizing that there is going to be a difference between what the certification values are and what the in-use average values are, that is really tampering, malmaintenance, and generally manufacturing related things that the manufacturer can do something about.

Malmaintenance and tampering are being addressed by the inspection and maintenance program. There are improvements that can be made in the inspection and maintenance program. We will be presenting a paper to SAE next month with some recommendations for that, primarily tampering inspection, to make sure that the converters are not being removed.

The difference should also be reduced as the lead in gasoline levels come down. That will make the catalyst less likely to be poisoned. We think that this is going to show some differences.

Finally, the things that you have done for the last six years has probably done the most to reduce the difference between in-use and certification, at least with respect to any portion that is related to the manufacturer's control, you have left the standards in place for five years to give us a chance to go out and look at what those vehicles are doing, look at what that technology does in use, and feed that information back to our engineers, and let those engineers make some changes in the product line. This is the first time that we have had a chance to take the data and having it applicable to the technology that we are still using.

We have a program to go out and test more vehicles than EPA does, so we can feed that data back to our engineers. We have seen dramatic improvements from 1981 to 1985 in our 50,000-mile engine performance. I think that we are seeing that now. I just don't think we are ever going to see the gap totally eliminated. The certification cannot represent the wide variety of uses and times of use.

Senator MITCHELL. I recognize that, and the entire committee does, that we will never have an identical certification and in-use performance, but I believe that there is a significant gap that can be closed to some extent.

Mr. Padgham, would you care to respond?

Mr. PADGHAM. I basically endorse what Mr. Leonard said. In terms of what we are directly doing—What you are getting at is what are we doing to the technology, what are we doing to the components as we have learned on the car systems. We have learned by hard experience and recall, I might add, that our systems are not fool proof to the reality of the marketplace, and we have made material improvements, and so forth.

As we learned how our process and systems react, we have refined our fuel metering control systems. With the help of the catalyst vendors, we have seen slow but small improvements in the catalyst's durability, but that has been very, very slow.

What I am really saying is that we are learning from experience. The improvements that we are making are small. They are positive, but they are small.

Mr. BUIST. One of the problems when you are fourth in line is that there is not much left to say, but just a couple of points that I would like to make.

In your CO chart, as the two come together, we have to conclude that many of the things that were just said have become more of a significant factor.

Tampering and misfueling—tampering is still at 20 percent, and it is a major concern of ours. However, we see that decreasing for several reasons. One, we see fuel prices, leaded and unleaded, starting to come together, and that is going to eliminate the incentive to tamper and misfuel, plus the lead coming out is of benefit.

I would raise a little caution with respect to the inspection and maintenance program. That is not to say that we don't support it, we do. I have people who spend all of their time with various States trying to help with the inspection and maintenance programs. But we see inspection and maintenance programs as a means of eliminating the gross emitting vehicles, vehicles that have been tampered, that are not working properly that emit emissions equal to four or five vehicles. We think that I&M is a program to take care of that group of vehicles, but as you drop the level of pass/fail cut points of inspection and maintenance programs, and again try to go after the little bit that is left, the programs become ineffective and cause a lot of customer dissatisfaction.

The inspection and maintenance program by design must use a very short test. It tries to equate that test to the certification test that takes upward of 18 hours. So when you lower the numbers, you get into trouble with respect to technical feasibility and equating it to certification. Again, I would just caution that inspection and maintenance is fantastic for getting at the gross emitters, but when you try to lower the overall level or cut points, the inspection and maintenance program can get away from you and become ineffective.

Senator MITCHELL. I have a brief concluding comment to make, but before I do, I would like to ask whether anyone has a point that they are just bursting to make, and was not able to make during this hearing, or if there is anything that I, or any other member of the committee, have said that someone takes particular exception to as being a misstatement of fact, or that otherwise should be corrected in the record?

Does anybody want to make a comment of that type?

[No response.]

Senator MITCHELL. If not, I want to thank all of you very much.

I want to say that this is a very difficult area. Two things are clear from the hearings that we have held. The first is that we have to have additional reductions in emissions. The second is that it will be much more difficult in the next decade to achieve such reductions than it was in the past decade. I think that everyone on the committee has to recognize that. When you get to 96 percent reduction, getting further than that is tough.

I hope that this year we can reduce, to some extent anyway, the level of confrontation that has existed on this issue in the past. It is clear from the record just how confrontational this has been.

Obviously there are economic interests, large interests at stake that can never be fully reconciled, I do think that it is possible to acknowledge that this is a serious problem in a difficult area, and to the extent that possible, we can all work together to try to achieve a solution that does provide protection to the health of the American people that the law requires, which I think no one seriously disputes, and that we do it in a manner that is least onerous to the ones who have to bear the burden of compliance.

That is our objection. We will try to do the best we can. Your testimony today has been informative. You have not made any decision any less difficult, but you have enabled us to approach it with a much better understanding of the problem from all points of view, and for that I thank you.

The subcommittee stands adjourned.

[Whereupon, at 12:10 p.m., the subcommittee adjourned.]

[Statements and other material submitted for the record follow:]

FE-4013

STATEMENT OF

GENERAL MOTORS CORPORATION

TO THE

SENATE ENVIRONMENT AND PUBLIC WORKS SUBCOMMITTEE

ON ENVIRONMENTAL PROTECTION

PRESENTED BY

SAMUEL A. LEONARD

APRIL 9, 1987

WASHINGTON, D.C.

Mr. Chairman, I am Samuel A. Leonard, director of the Automotive Emission Control Department at the Environmental Activities Staff of General Motors Corporation. GM welcomes this opportunity to present its views on the ozone and carbon monoxide nonattainment situation being faced by many urban areas, and other aspects of the Clean Air Act. Our comments will focus on the public policy and technological implications of tighter emission standards, increased useful life, tighter Selective Enforcement Audit criteria, rhodium availability, refueling vapor control, ozone and carbon monoxide nonattainment, and nitrogen oxide emissions.

I. Public Policy

In a simplistic view, the operation of the Clean Air Act is a series of steps based on scientific and technology decisions. Health experts determine at what level pollutant concentrations will have adverse health effects and with that information the Environmental Protection Agency (EPA) Administrator establishes the National Ambient Air Quality Standards (NAAQSs). Atmospheric loadings of pollutants are determined and the necessary reductions to reach the NAAQSs are calculated. Then primarily through regulation by EPA, but in some cases by Congress, the reductions are allocated and the timing to achieve them is set.

In fact, this approach is not working as designed. From the perspective of the major automobile manufacturer in the U.S., the mobile source standards and compliance requirements of the legislation before this Subcommittee involve not only technological considerations, but other public policy considerations.

Our views of the technological considerations are amply discussed in the remainder of this statement. Those discussions show that mobile source reductions have been major contributors in the success that has been achieved in reducing ozone and carbon monoxide (CO). These reductions will continue as new cars with the latest technology, which reduces hydrocarbon (HC) and CO by 96%, replace older higher emitting cars.

Note: The attachments to this statement have been retained in committee files.

They will also explain that no new major technological breakthrough is on the horizon to meet more-stringent requirements. As we push the limits of current technology, the chances for failure increase. Failure to certify a model means it cannot be sold or must be compromised in fuel economy, driveability, and/or performance such that it is less appealing in the marketplace. Failure to meet standards "in-use" means expensive recalls. The task of developing, testing and certifying to standards of ever increasing stringency is not only increasingly technologically risky, it is extremely costly both in dollars and engineering resources -- resources that might otherwise be used to improve quality, develop better manufacturing methods or more appealing products. Also, the costs of the emission control hardware and warranty are not insignificant.

The emission requirements being considered in legislation before this Subcommittee are by far the most stringent of any country in the world and are not justified by corresponding air quality benefits. The domestic industry is engaged in a competitive struggle for survival and this country can ill afford the diversion of domestic manufacturers engineering resources away from improving its competitiveness in pursuit of minimal air quality benefits. Thus, additional costs by imposing more-stringent emission requirements involves other public policy issues, not only technological ones. The issues involved are competitiveness, jobs, and even involvement with South Africa.

With respect to competitiveness, some will argue that, because all cars, both foreign and domestic, must meet the same requirements, stringent emission requirements do not influence competition. This is not the case. Particularly at very low emission levels, small cars with four-cylinder engines are inherently easier to control than larger cars with six- and eight-cylinder engines. The most successful foreign competitors specialize in the former, whereas the latter is the bread and butter of full-line domestic manufacturers. In the case of the larger family size vehicles which require six and eight-cylinder engines, there is greater technological risk regarding the ability to meet more stringent standards. Inability to certify, and hence produce, such vehicles would shift demand to the smaller car segment where foreign competitors have a well documented cost advantage, thus increasing jobs overseas and reducing employment in the United States.

More stringent emission standards also will force the use and therefore the importation of more rhodium for gasoline fuel engines which in the long term must come from South Africa.

Thus, while motor vehicle emissions remain a high visibility target despite achievement of 76% nitrogen oxide (NOx), 96% CO, and 96% HC reductions, the broader implications of further tightening of the standards cannot be ignored. Considering the future progress that will occur naturally from continued refinements permitting greater "in-use" compliance with existing standards and the air quality benefits that will occur from ongoing fleet turnover, the actual costs of more stringent requirements could range far beyond the realm of research, development, production, warranty, and recall dollars.

II. Tighter Tailpipe Standards

Certification Versus "In-Use"

> It is not unusual from an engineering standpoint to try to certify below the standards....Because engineers can achieve a lower level of emissions in certification does not necessarily mean that the vehicle can achieve these levels in use or that standards should be made lower by EPA or the Congress.

These quotations from the EPA Administrator's reply to a Congressional inquiry, essentially reflect our position as well as our experience.

The technology obstacles in achieving more-stringent emission standards (for example, a 0.4 to a 0.8 g/mi NO_x standard along with a 3.4 g/mi CO standard and a 0.25 to a 0.41 g/mi HC standard) are formidable enough for full-line manufacturers in the certification process, but achieving these levels for the "useful life" of a vehicle in the real world, i.e. in customer usage, presents a much greater challenge. The certification process, of necessity, is a simplified simulation of actual customer usage. As a practical matter, it cannot and should not be expected to encompass the wide variety of operating conditions, fuels and temperatures to which vehicles are subjected in customer use and abuse. It is, by necessity, an accelerated mileage accumulation process, attempting to compress five years or more of normal operation into a much shorter time frame. Therefore, compliance with emissions standards, demonstrated by obtaining a certificate of conformity, is not a reliable basis for concluding that these emission standards can be achieved for the useful life in actual customer usage. (If it were, EPA would have no need to conduct surveillance programs and the Clean Air Act would not need Section 207(c).) Because the certification process cannot ensure "in-use" compliance, manufacturers must of necessity lessen the risk of noncompliance by lowering, whenever possible, new vehicle emission levels. The problems inherent in using certification values to predict achievability of an emission standard in actual customer usage are greatly exacerbated if the statutory useful life is doubled.

The engineering rationale for designing below a standard stems from an understanding of the emissions variability displayed at the 50,000 mile useful life point. Any emission control system hardware/engine combination will have a statistical distribution of emissions levels at the 50,000 mile point. The mean of this distribution must be maintained sufficiently below the standard to assure that the vehicles represented by this distribution will be in compliance for their full useful life. The problem is compounded for full-line manufacturers who must be concerned with the full spectrum of vehicle models and weights.

The problems associated with achieving lower useful life emission levels can best be illustrated by a comparison of various NOx emission levels. For example, for a NOx standard of 1.0 g/mi, the average "in-use" target might be 0.6 to 0.7 g/mi to assure compliance "in-use" with the standard by all engine families, and at a 0.7 g/mi standard, the average target might be 0.4 to 0.5 g/mi. Again the problem of full-line manufacturers is exacerbated because NOx emissions are especially sensitive to engine size and vehicle weight. Full size vehicles with 8 cylinder engines generally emit at higher NOx levels. These vehicles would be the first to be impacted by more-stringent NOx standards.

Many factors other than vehicle weight also contribute to the ability of an engine family or vehicle model to achieve emission standards. These factors include the responses to emission control hardware used on dissimilar engine displacements and the vehicle driveability associated with a particular engine/hardware combination. Because of the interaction of these factors all combinations will not have the same emissions performance level. Additional variations are caused by basic engine differences and production variability which will occur within each engine family.

Clearly, certification does not represent "in-use" operation. Certification cannot be run under all "in-use" abuse and use conditions and can in no way represent the broad spectrum of real life vehicle operation.

Therefore, setting standards based upon certification data alone ignores the realities of "in-use" operation and is wrong.

Certification/SEA Versus "In-Use" Performance The differences between certification and "in-use" performance are well documented. The average "in-use" HC, CO, and NOx emission results at 50,000 miles have improved substantially from the 1981 to the 1985 model years.

However, the certification and SEA results are fairly constant at 50-60% of the HC standard from 1981 to 1985.

Clearly, being able to certify and pass SEAs considerably below the standard does not mean that those low levels can be met "in-use." As already stated, we should be capable of certifying at levels that achieve average "in-use" levels that are 60-70% of the standard in order to have a reasonable recall liability risk "in-use." In addition, these levels represent averages. Actual engine family levels range around the average. For full-line manufacturers, the broad spectrum of product line generally results in a broader range, putting more vehicles at risk if the standard is tightened.

"In-Use" Emission Control Progress The "in-use" emission performance for General Motors vehicles has improved significantly since the introduction of closed-loop fuel control technology in 1981 for the Federal standards of 0.41 g/mi HC, 7.0 or 3.4 g/mi CO, and 1.0 g/mi NOx. The data show a dramatic improvement in performance since the 1981 model year.

However, we are not satisfied with the performance at the 1985 level. We are continuing to work at improving the emission performance of our future vehicles to reduce the risk of recalls. This is a complex process requiring further development of advanced engine-emission systems and incorporation of these advances into production vehicles. Our goal is average emissions for each engine family at 70% of the standards "in-use." Such a goal is necessary to assure that none of our many engine families will be subject to recall. We are not confident of our ability to accomplish this goal in the near future. Stable emission standards are necessary to allow further refinement of the emission system design and manufacturing process for continued improvement in durability, reliability, and control system performance.

Future Technology It has been suggested that it should be easy to carry over California's more-stringent NOx emission control system nationwide. It should be noted that California allows higher CO levels, which allow the system to be calibrated to achieve improved NOx reduction in the catalytic converter.

California currently has a 0.7 g/mi NOx standard and is moving toward a 0.4 g/mi NOx standard in the 1989-94 model years. General Motors is trying to achieve these standards through refinements of the current technology such as calibration, better air-fuel ratio control, improved catalysts, and increased noble metal loadings. We are hopeful that these technology refinements, the margin due to the less-stringent CO standard, and the possibility of increased catalyst loading will allow us to meet the 0.4 g/mi NOx certification standard. However, we may be unable to offer some models in California due to an inability to meet the standards.

The 0.25 g/mi HC, 3.4 g/mi CO, and 0.4 g/mi NOx emission levels, as proposed by S.300, are considerably more-stringent than the future California standards due to the lower HC and CO levels along with the 0.4 g/mi NOx levels. At this time, General Motors is not aware of any significant new technology that can be applied to achieve these proposed standards. Any attempt to meet such standards would concentrate on improved catalyst technology, better fuel metering control, increased noble metal loadings, and increased exhaust gas recirculation tolerance. All of these represent fine tuning of existing technology.

There is a particular dilemma with regard to noble metal loading -- especially rhodium. Increased loadings may improve emission control system performance. However, there are questions as to the cost and/or availability of the amounts of metals such standards would require. See

Section V for a further discussion of rhodium availability.

General Motors is continuing to improve the emission performance against the existing standards in order to reduce the considerable risk of non-compliance and recalls. At this time, the answer to whether 0.25 g/mi HC, 3.4 g/mi CO, and 0.4 g/mi NOx standards can be met "in-use" is strictly speculative. Moreover, the 100,000 mile requirement makes achieving these standards exceedingly difficult. (See Section III for further discussion.) When and if General Motors can meet lower standards across our full-line product spectrum are unknown at this time.

Methanol-Fueled Vehicles Meeting such standards with alternative motor fuels, such as methanol, is even more difficult to predict. General Motors is active in development programs for neat methanol and variable fuel vehicles. In addition, we have an active program for methanol engines in urban buses. (See Attachment II-1.) Although some technological problems still exist, the major inhibition to widespread methanol use is economic. Our calculations show that methanol will not be economically viable until the price of gasoline reaches about $1.40 per gallon. (See Attachment II-2.) Too little data exist to predict the emission standards such vehicles might meet in customer usage or the impact on ozone air quality.

Light-Duty Trucks General Motors maintains that HC emission controls must be technologically feasible and cost effective. On the bases enumerated above, we do not support more-stringent emission standards for any vehicles, including light- and heavy-duty trucks. In response to a recent Advanced Notice of Proposed Rulemaking (ANPRM) for further gaseous emissions regulations on trucks, General Motors detailed its reasons for opposing more-stringent standards. We do recognize that concerns for ozone air quality can lead to pressure for continued improvement in emissions from motor vehicles. However, we question whether the very minor improvements in ambient ozone levels available from tighter truck emission standards can justify the significant and disproportionate development efforts required and the expected adverse impacts on light-duty truck performance and customer acceptance.

Data are very limited to determine the potential to achieve the necessary emission improvements, especially since truck standards must be met for 11 years, 120,000 miles. The limited, high mileage data that are available show that major technological improvements would be needed, raising doubts that any known technology will be able in the forseeable future to achieve the necessary emission improvement. We are also concerned that changes to reduce HC emissions could cause degradation in fuel economy, driveability and customer acceptance or would limit light-duty truck model availability so severely that market demand would not be satisfied.

Heavy-Duty Engines With respect to heavy-duty engines, EPA just went through an extensive rulemaking to arrive at appropriate NOx and particulate standards. The standards now in the regulations represent technology-forcing levels which will require extensive development.

Proposals for even more-stringent standards are premature since we still are not sure we can meet the current standards. EPA sponsored studies have shown that a 4.0 g/bhp-h NOx standard for heavy-duty diesels, if achievable, could cause a severe loss in fuel economy, severly impacting the competetiveness of the diesel engine and adding to the nation's oil consumption. With respect to the 1.7 g/bhp-h standard proposed in S.300 and S.321, we know of no technology which would achieve such stringent levels.

III. Increase in "Useful Life" of Passenger Cars

It should be noted that the Clean Air Act definition of "useful life" is in reality the "half-life" of a vehicle. This concept recognizes that ambient air quality is influenced by average emissions from the average vehicle. Average passenger car life is about 100,000 miles and, assuming linear deterioration of emissions performance, its average emissions occur at the midpoint of its actual life or 50,000 miles. Changing the "useful life" to 100,000 miles, "full-life," would abandon this "half-life" concept, effectively increasing the stringency of the standards and subjecting manufacturers to responsibility for factors beyond their control, as will be discussed below.

The difficulty in meeting any of the proposed more-stringent standards in actual use is greatly exacerbated by the proposed doubling of the "useful life" to 100,000 miles. In order to accommodate the inherent catalyst deterioration with mileage, new vehicle emissions would have to be significantly lower to meet an 100,000-mile standard as compared to the existing 50,000-mile standard. This tightening with an 100,000-mile standard is illustrated in Figure III-1. As shown, the emission intercept at 4,000 miles for the 100,000-mile useful life is considerably below the 4,000-mile-intercept for 50,000 miles -- a significant increase in the stringency of the emission standard.

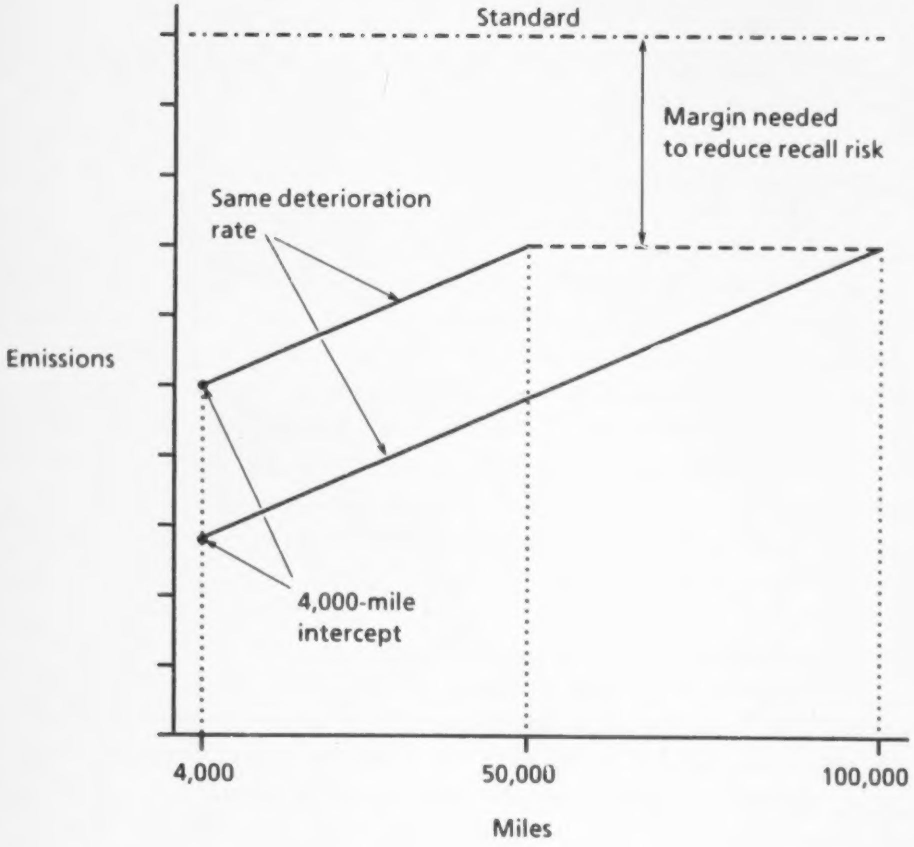
Any assessment of our ability to achieve standards "in-use" for 100,000 miles for cars must await the results for full-life standards for trucks. Currently, we do not know if full-life standards can be meet "in-use," since the truck full-life requirement has been in effect only since the 1985 model year. As the vehicle ages, the ability of a manufacturer to influence emissions (through vehicle design) wanes, and emissions become more and more related to general engine condition, degree and quality of maintenance, fuel quality, and usage of the vehicle. In fact, only about half the cars reach 100,000 miles before being scrapped or needing a major overhaul. Since it is extremely difficult to determine the contribution of these uncontrolled factors to the emission performance of the vehicle in the enforcement process, the manufacturer is likely to be held responsible for vehicles which exceed the standards due to factors beyond its control. In the extreme, the end result is the absurd requirement that a manufacturer guarantee the emission performance of the vehicle as it passes through the junk yard gate.

In addition to extending the compliance period, a doubling of the useful life to 100,000 miles also extends the warranty of the emission components to 100,000 miles. As noted above, at 100,000 miles, approximately one-half of the cars will have been scrapped due to mechanical wear-out or other reasons. Not only is it difficult and expensive (and wasteful) to design emission control systems to last longer than many of the vehicles on which they are installed, but current regulations require that many components only remotely related to emission control, to be warranted for the vehicles's useful life. In effect, manufacturers would be required to provide a lifetime guarantee on much of the vehicle. Thus, an 100,000-mile useful life requirement would add significantly to the cost of an automobile, which would have to be borne by the customer. EPA recognized this legitimate concern of manufacturers in the case of trucks and limited the emission warranty to 5 years/50,000 miles.

The proposed increase in "useful life" also would complicate the process for certification of new engines and vehicles. Certification testing, which currently takes about 18 months, would have to be conducted over 100,000 miles instead of 50,000 miles, doubling the time required and significantly increasing costs and administrative burden. If a problem became evident only at very high mileage, testing would have to begin all over again with a vehicle starting at zero miles after the problem was corrected. Given the magnitude of the challenge the proposed standard would present, the effective dates proposed in S.300 and S.321 provide no time to develop the new technology needed, then to design, build and test the resulting products. Where "invention" is necessary, it is difficult to estimate when compliance would be possible, because inventions cannot be scheduled.

Figure III-1

Effect of Longer Useful Life



IV. Changes in Selective Enforcement Audit

S.321 would also change the criteria by which EPA determines, through the Selective Enforcement Audit (SEA) process, if a vehicle manufacturer is in compliance with the emission standards at the time of production. Since it is impractical to test every vehicle as it is produced, the EPA uses an end-of-assembly-line sampling plan to make a decision whether a particular engine family type is in compliance. Even though the EPA selectively chooses only a fraction of the production engine families to audit, a manufacturer must ensure that all vehicles can comply if tested during an SEA. The consequences of failing an SEA can be very severe, resulting in closing of the plant until vehicle design changes are made and a second audit shows the vehicles comply.

The proposed change would lower the Acceptable Quality Level (AQL) from the current 40% to 10%. The 40% AQL was established by EPA when the SEA regulations were promulgated and assures that the average emissions meet the standards. This is a correct and sensible criterion because the atmosphere, in fact, mixes the emissions from all vehicles and therefore sees the average. Further, air quality projections and calculations of emission reduction requirements for attainment are all based on average emission values.

The proposed change in AQL from 40% to 10% would have the effect of lowering the emission standards by about 33% for certain engine families. The following discussion explains this statement.

Current SEA Requirements The current sampling plan was designed by the EPA so that a engine family would most likely not fail the SEA if less than 40% of the vehicles tested exceed the standard. This "40% acceptable level" is roughly equivalent to demonstrating that the average emissions of this engine family are below the standards. (This can be shown by assuming that emissions fit a log-normal distribution curve and have a typical coefficient of variation.) Figure IV-1A shows the emissions distribution of a 40% AQL engine family. The shape of the curve reflects the degree to which the emissions can vary because of the production variability, testing variability, etc.

Proposed SEA Changes The proposed change to the SEA test requirements would permit, at most, 10% of the vehicles to exceed the standard. As shown in Figure IV-1B, this would result in requiring an engine family's emissions to be shifted significantly to the left. Having less than 10% of the vehicles above the standard requires an engine family's average emission level to be reduced significantly -- in effect a significant lowering of the standards.

Effect of Proposal As an example of the effect of this proposal consider the following estimate. Assuming emissions fit a log-normal distribution curve with a coefficient of variation of 0.4, an engine family that now has a 5% chance of failing an SEA would have a 95% chance of failing under the proposed change. In order to retain the 5% chance of failing an SEA, the engine family's average emission levels would have to be reduced by about 33% (see Figure IV-1C).

Figure IV-1A

Distribution of Emissions Data at 40% AQL

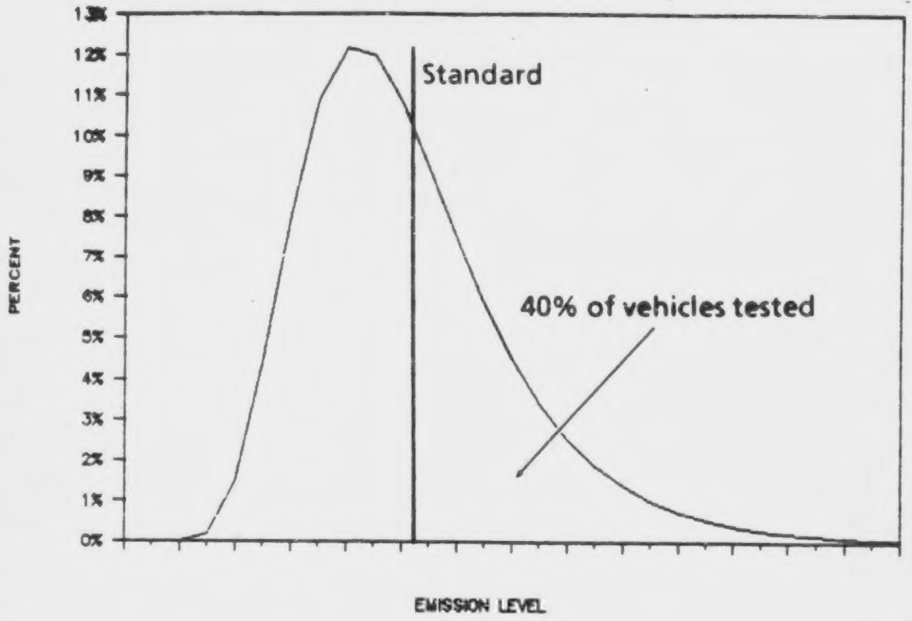


Figure IV-1B

Distribution of Emissions Data at 10% AQL

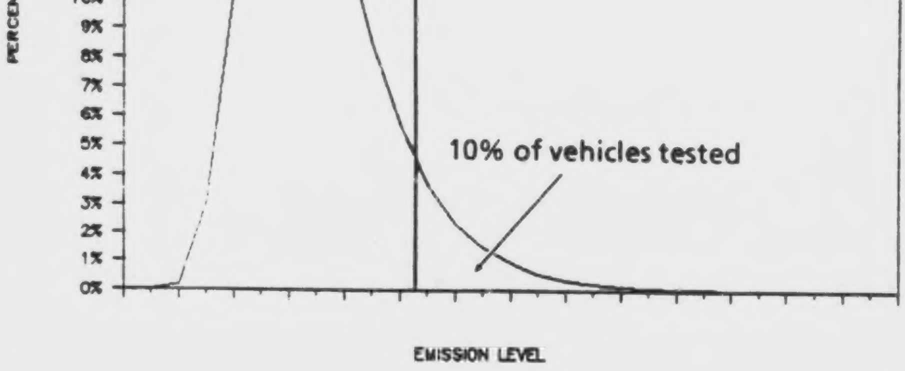
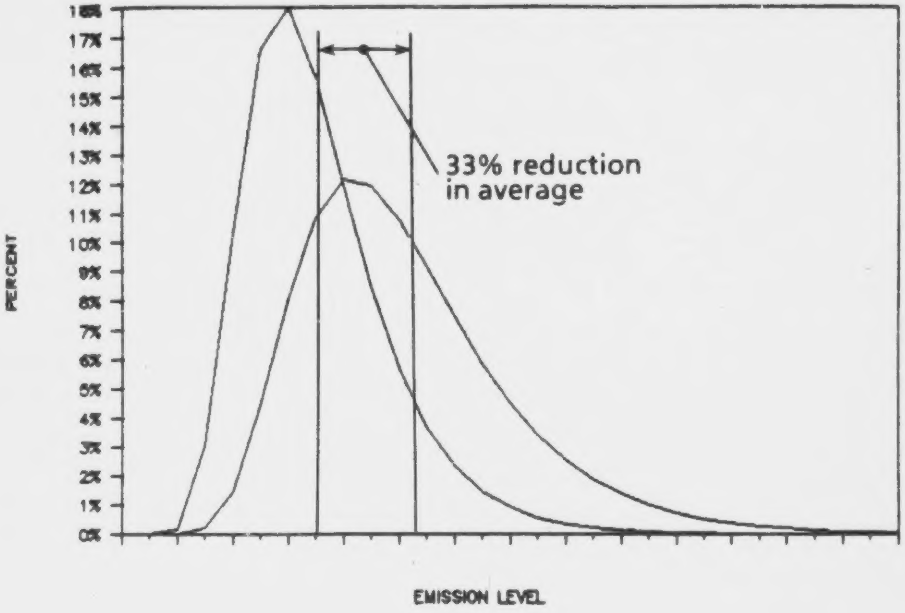


Figure IV-1C

Comparison of Distributions at 10% AQL and 40% AQL



V. Rhodium and Catalytic Converters

As previously noted, increased noble metal loading, especially rhodium, on catalysts is one method that might be used to improve emission performance. Thus, rhodium availability is a major concern. Currently, all of the rhodium being mined is being consumed. Our source of rhodium is Impala Platinum Ltd., a South African supplier. South Africa contains approximately 95% of the world's known rhodium reserves, with the Soviet Union accounting for most of the balance. General Motors is currently purchasing the maximum amount of rhodium allowed under our contract with Impala. Impala has advised General Motors verbally that a significant increase in its rhodium production capacity would require an additional commitment of several hundred million dollars. Recently because of market conditions and our need for rhodium, General Motors was forced to purchase rhodium from the Soviet Union.

Rhodium is produced as a by-product of platinum mining. It occurs in a ratio of one ounce of rhodium for each 20 ounces of platinum produced. This situation makes it economically infeasible to expand mining capacity in response to an increase in rhodium demand.

The imbalance between supply and demand for rhodium is evident from the price, which has quadrupled in the last four years. The automobile industry already uses more than 60% of the world's rhodium production, and automotive demand is rising as more countries adopt stringent automobile emission requirements. By 1990, the automobile industry is forecast to be using more than 80% of the world's rhodium production. This forecast assumes no tightening of the current NOx emission standards.

VI. Refueling Vapor Control

There has been much discussion about proposals to control vapors emitted during vehicle refueling as a means to reduce HC emissions. While there is the potential to reduce HC emissions through refueling control, General Motors believes that a nationwide onboard control program is inappropriate. General Motors, both directly and in concert with the Motor Vehicle Manufacturers Association (MVMA), has responded to various EPA requests for comments on the subject of the control of refueling vapors.

No direct human health risk from exposure to refueling vapors has been established and there is strong evidence to suggest that none will be found. Thus, there is no health-based justification for requiring nationwide control of refueling vapors.

General Motors laboratory development work has shown that large charcoal-filled canisters onboard the car can successfully collect refueling vapors. Other organizations, including the API, have published similar results. However, none of these have met all of the design criteria required for a production-ready onboard control system. In particular, none of the onboard systems, including those developed by General Motors, has successfully addressed the critical issues of safety, durability, packaging, and the effect on exhaust HC emissions. These and other unresolved technical issues would require solution before a system could be put into production. These differences are even more pronounced for our truck lines.

Even assuming these issues are resolved, General Motors estimates that it would require a four-year leadtime after final regulations are promulgated to begin production. Given this, and the twelve to fifteen years required to turn over the vehicle fleet, it would be sometime early in the next century before full benefits of vapor reductions from onboard controls would be realized.

Moreover, onboard vehicle control is the least cost-effective approach among available strategies under consideration. Using EPA's own data, adjusted for more reasonable consumer costs, the annual recurring costs to the automobile industry, and thus, its customers, for onboard vehicle controls have been conservatively estimated at a half billion dollars or more.

An independent study comparing the costs of refueling control systems is currently underway and will be available soon. The study is being conducted by Multinational Business Services, Inc. in conjunction with Radian Corporation, and Mueller and Associates, Inc. MVMA will provide a copy of the study to the Subcommittee at the earliest opportunity.

VII. Ozone Nonattainment

Current Status EPA projects that many areas will not meet the ozone standard by December 31, 1987, the deadline set by the Clean Air Act. The fact that most of these areas are major metropolitan areas has sparked many comments and press reports about tens of millions of people breathing unhealthy air. While we do not want to ignore the problem that some of these areas face in reaching compliance, we believe the overall situation is not nearly as bad as such statements would imply. Our primary reason for this belief is that the current ozone standard provides a sufficient margin of safety so that most people who live in nonattainment areas are rarely, if ever, exposed to ozone levels that could cause any adverse effect. Second, the fact that an area remains classified as nonattainment does not mean progress is not occurring. The average level, the frequency of exceedances, and the geographic extent of the exceedances can be and usually are declining. Thus, person-hours of exposure continues to decrease significantly.

Extreme Values One of the problems with forecasting future attainment is directly related to the form of the current ozone standard. A few extreme values (usually due to unusual meteorological situations) can result in an area being classified as nonattainment. The current standard of 0.12 ppm measured for one hour, not to be exceeded on more than four days in three years, focuses on what statisticians call an "outlier" or "extreme value." In layman's terms, it would be called a rare event. It is well known that such extreme values have large uncertainties, are generally unpredictable, and are not representative.

For a number of reasons, we believe a more robust statistic is required, that is, more of the monitoring data should be used to define exceedances of the standard. This could be done, for example, by allowing no more than five or seven exceedances a year or no more than "X%" of the daily maxima above a given concentration. From EPA's review of the state-of-knowledge concerning the effects of ozone on human health and vegetation, it is clear that the primary concern in both cases is the effect of repeated peak exposures. A more robust statistic would reduce statistical uncertainty, and thereby characterize the high-end of the concentration distribution much better than the current extreme value approach.

Using a more robust statistic to define the standard would have additional benefits. A more representative and more predictable statistic would provide a reliable measure of how far out of attainment an area is and a more accurate measure of the year-to-year progress toward attainment. The current extreme value approach is clearly defective in these areas.

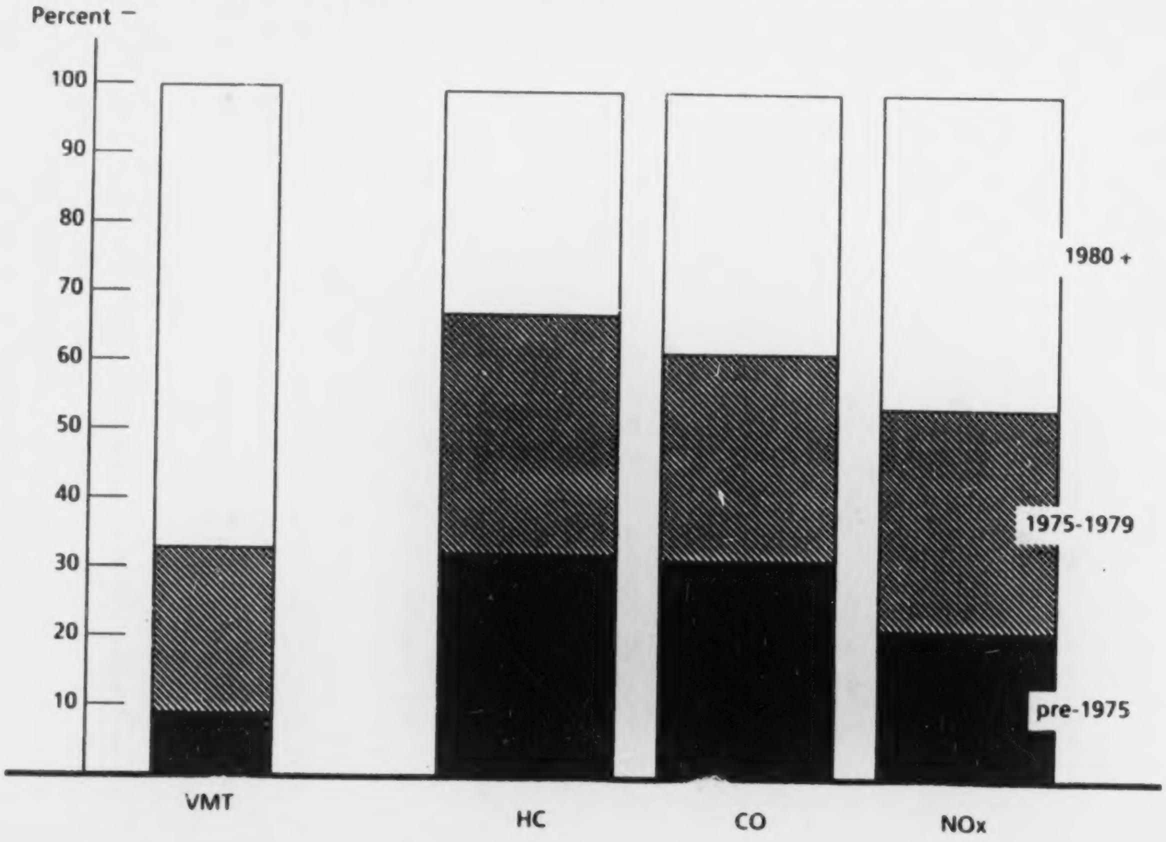
Future Attainment According to EPA projections, about half of the 1982-84 nonattainment areas will achieve the standard by the deadline. This indicates that progress is continuing in reducing ozone levels. It is clear that mobile source reductions have contributed to that progress. In fact, based on the EPA emission trends, mobile source emission reductions have been the prime factor. Reductions in mobile source fleet emissions will continue to occur as older vehicles are replaced by newer ones. In fact, a recent General Motors analysis of California's inspection/maintenance (I/M) data indicates that about 70% of the mobile source emissions come from the oldest 40% of the vehicles which contribute only about 30% of the total miles traveled. (See Figure VII-1.) As these older vehicles are removed from the vehicle fleet, mobile source emissions will drop dramatically. Incidentally, it should be pointed out that many state I/M programs provide an exemption for older vehicles which are contributing the greatest amount of emissions.

In his testimony before Mr. Waxman's subcommittee, EPA Administrator Thomas stated that the current federal motor vehicle emission control program would provide a 25% reduction in total HC emissions in nonattainment areas by 1992. Since mobile sources generally account for less than one-half total HC emissions, such a projection translates into a reduction in mobile source fleet emissions of more than 50%.

We believe EPA's projection is pessimistic. It is based on EPA's MOBILE3 model. That model assigns expected emission levels for past and future vehicles and uses those values to project total mobile source emissions. The emission levels assigned are based on what EPA expects vehicle emission levels to be "in-use" in customer hands and includes tampered or malmaintained vehicles and excess emissions related to manufacturers failure to achieve the standards "in-use." The MOBILE3 model was constructed in 1982 using data from 1981 model year vehicles as the example of future technology vehicles. As such, it does not comprehend the improvements in "in-use" performance accomplished by manufacturers in subsequent model years. If we can continue to achieve the current emission standards "in-use," the reduction in mobile source fleet emissions by 1995 can approach 80-90% from the 1984 levels. Conversely, with new vehicle emissions so low, more-stringent emission standards will have very little impact in improving air quality.

Figure VII-1

Comparison of Vehicle Age, Miles Traveled, and Emissions



VIII. Carbon Monoxide Nonattainment

Progress Substantial progress has been made in reducing ambient CO concentrations over the past decade. As noted in EPA's 1986 Air Quality and Emission Trends Report, the mean of the second-highest eight-hour average carbon monoxide (CO) concentrations at 157 sites throughout the nation decreased 34% between 1975 and 1984. The 90th percentile of the same distributions, which would represent roughly the sixteen highest sites in each year, decreased 42% between 1975 and 1984. The average number of exceedances of the eight-hour air quality standard decreased 88% over the same time period. Automobiles are responsible for most of this improvement. Such improvements can be expected to continue in the future as new cars with current, lower CO emission levels continue to displace older vehicles in the fleet. Because of this continuing progress, it appears that most areas presently experiencing CO attainment problems should be able to meet the air quality standard by 1990.

Again, if we examine the health risks faced by people in CO nonattainment areas, they are less significant than was previously thought. There has been increasing evidence in recent years that the current CO air quality standard is much more stringent than necessary to safeguard public health. That standard was based on studies that have proven impossible to replicate and which have been largely discredited. If the CO standard were at a level supported by scientific health effects data, for example, 12-15 ppm, more areas of the country would attain the standard.

Extreme Values Although substantial progress has been made in reducing ambient CO concentrations over the past decade, many sites still remain above the standard. Part of the difficulty may arise because the CO air quality standard is an extreme value, which makes it difficult, if not impossible, to predict future trends. The highest ambient CO concentrations will occur under a combination of low dispersion and high emissions. For a particular monitoring site, the high concentrations may be related to a particular occurrence of adverse meteorology and heavily congested traffic.

Site Representativeness As ambient levels of CO approach attainment, the representativeness of individual sites should be examined to determine if their reported values should be used to represent exposure. The CAMP site in Denver is such a site. It is located on an island in the middle of a street with no one spending much time near the site. In addition, the traffic near some CO sites should be examined to determine how traffic flow can be improved to reduce congestion around the site. A few years ago, the Stamford, Connecticut site was reporting eight-hour CO values of 22-32 ppm, among the highest in the country. Then, traffic congestion around the site was reduced by street improvements, and, in 1985, that site was in compliance with the eight-hour CO air quality standard (9 ppm). It makes little sense to impose stringent national emission standards (and the resulting costs) to address nonattaining CO levels resulting from non-representative monitoring or poor traffic control.

IX. NOx Emissions

NOx/Ozone Trade-off Since HC and NOx are known to react in the atmosphere in the presence of sunlight to form ozone, it might be obvious that reducing both ingredients would reduce ozone formation. One would not expect that lowering one of the ingredients would actually increase ozone. But that is the case. The situation results from the paradoxical fact that NOx both inhibits and promotes ozone formation. This paradox was discovered in smog chamber studies conducted over 25 years ago.

Although the NOx inhibition phenomenon is counterintuitive, each time we have studied this question, in the laboratory, with computer models, or with field experiments -- we have found the same answer. It is a real phenomenon of nature.

Therefore, the HC/NOx ratio is important in the determination of the effectiveness in achieving ozone attainment. General Motors has previously reported and testified that NOx emissions both promote and inhibit the ozone forming reactions which occur in the atmosphere. Whether promotion or inhibition occurs in a given location depends to a great extent upon the HC-NOx ratio. Based on experiments conducted by General Motors in Detroit, where the HC/NOx ratio is below 6:1, reductions in NOx will increase ozone. (This effect is demonstrated in the attached paper by Kelly, January, 1985. See Attachment IX-1.) Similar experiments conducted in Los Angeles by scientists from Environmental Research and Technology, Inc. have demonstrated that reductions in NOx will increase ozone at HC-NOx ratios up to 15:1. At higher ratios, which are typically found in less populated areas, NOx reductions will reduce ozone.

There is still some uncertainity over the HC/NOx ratio at which the transition from NOx inhibition to NOx promotion occurs and over the HC/NOx ratios in various U.S. cities. We believe major U.S. cities have early morning HC-NOx ratios between 5:1 to 15:1. In cities with such ratios and current ozone concentrations considerably over the air quality standard, further NOx reduction will increase ozone. The early morning HC-NOx ratio is a strong determinant of the ozone forming potential of the emissions on any specific day.

Because the NOx-ozone issue is particularly important in California's South Coast Air Basin (SCAB) and since we still do not have universal agreement on the magnitude of the effect, General Motors is participating actively with the California Air Resources Board and other participants in the massive Southern California Air Quality Study to be conducted in 1987.

General Motors scientists are not the only scientists who recognize the complex nonlinear role of NOx in ozone formation. Over the years more and more scientists have come to accept this paradox, and in recognition of this phenomenon, the chemical mechanisms included in computer models to determine the effects of HC and NOx reductions incorporate the inhibition effect. The HC reductions required to reduce ozone from 0.40 to 0.12 ppm as predicted using six computer models with different chemical mechanisms are shown in Figure VIII-1. (This figure is derived from the published work of Seinfeld, Atmos. Environ., Vol. 20, pp. 487-499, 1986.) As the HC-NOx ratio (called ROG-NOx ratio on Figure VIII-1) increases from 6:1 to 20:1, the HC (called ROG on Figure VIII-1) reduction required for attainment also increases.

Note that reducing NOx increases the HC-NOx ratio. The results of Figure IX-1 clearly show that for HC-NOx ratios typical of the SCAB, lowering NOx will require increased HC reductions in order to attain the ozone air quality standard. Also, further NOx reduction would move the location of highest ozone from its current less populated downwind location to a more central-city location where the population is the greatest. Clearly, further NOx reduction in the SCAB will increase human ozone exposure. The situation is not unique to the SCAB; other U.S. cities have the same situation.

Since the nitrogen dioxide (NO_2) air quality standard has been attained in all areas of the country except for a few counties in the SCAB and

NO_2 attainment in the SCAB is projected within a few years, there is little need in Southern California and no national need what-so-ever to reduce NOx further.

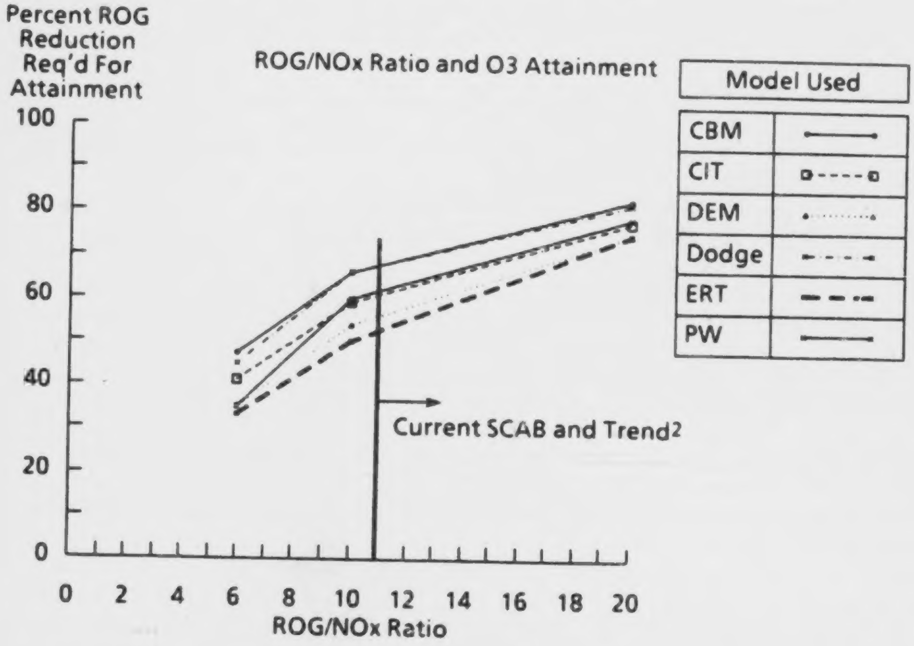
Because of the continuing accumulation of scientific evidence concerning the NOx inhibition effect, General Motors is convinced that control of mobile source NOx beyond that required to meet the NO_2 air quality standard will aggravate and prolong the nation's ozone problem. Clearly, policies which act to reduce the HC-NOx ratio as well as HC concentrations will lead to faster progress toward attainment.

SENATE
4/7/87

Figure IX-1

WHAT THE VARIOUS MODELS PREDICT ABOUT SCAB OZONE ATTAINMENT[1]

	% ROG Reduction Required to Reduce O_3 Levels from 0.40 to 0.12 ppm at ROG/NOx Ratios of:		
	6	10	20
Model:			
Carbon Bond Mech. (CBM)	47%	66%	83%
Caltech (CIT)	41%	59%	78%
Demerjian (DEM)	35%	54%	75%
Dodge	45%	66%	82%
Env. Research/Tech. (ERT)	33%	50%	75%
Lawrence Livermore (PW)	35%	60%	79%



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[1] T. B. Shafer and J. H. Seinfeld, "Comparative Analysis of Chemical Reaction Mechanisms for Photochemical Smog II", Atmospheric Environment, Vol. 20 No. 3, 1986, 487-499

[2] California Air Resources Board, "The Effects of Oxides of Nitrogen on California Air Quality", March, 1986, 49

GM

Environmental Activities Staff
General Motors Corporation
General Motors Technical Center
Warren, Michigan 48090

May 11, 1987

The Honorable George Mitchell
Chairman, Subcommittee on
Environmental Protection
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

General Motors hereby submits for the record the attached responses to questions asked by Senators Chafee and Stafford during the April 9 hearing on "Potential Additional Controls on Motor Vehicles Under the Clean Air Act."

We also want to clarify our answers to other questions regarding the ability of auto manufacturers to achieve past mandated emission reductions and to explain why General Motors' opinions sometimes differ from the opinions of other auto manufacturers.

In your introductory remarks, you stated that auto manufacturers have always met tighter emission requirements adopted by the Congress over our objections. To the contrary, we pointed out that these requirements, to which manufacturers had objected for various reasons, had, in some cases, not been met on the originally proposed timetable.

For example, the 1970 Clean Air Act amendments established passenger car exhaust emission requirements for 1975 (1976 for NOx) of 90% reduction from then current levels. EPA translated these requirements into standards of 0.41, 3.4 and 0.4 grams per mile (gpm) for hydrocarbons (HC), carbon monoxide (CO) and oxides of nitrogen (NOx) respectively. However, subsequent EPA and Congressional actions delayed implementation of the HC requirement until 1980, the NOx requirement (at a Congressionally-adjusted level of 1.0 gpm) until 1981, and the CO standard first applied to all cars in 1983. Thus, we believe the original objections of the manufacturers were proven to be well founded.

Further, it should be emphasized that today's emission control levels have been achieved only at a tremendous financial cost to automobile manufacturers and their customers. A Brookings Institution publication has estimated recently that the emission control hardware on a typical 1986 car added about $592 to its cost. Applying this figure to General Motors 1986 model year auto production indicates a cost to our customers of more than $2.6 billion in that year alone. As was mentioned in our testimony, if it were possible to achieve additional reductions beyond the current 96% control of HC and CO and the 76% control of NOx, this requirement would add even more cost but would do little to improve air quality. This question of cost is especially relevant as domestic manufacturers seek to match and beat foreign competitors' quality and costs.

Regarding General Motors comments on our ability to meet tighter automobile emission standards and on such other matters as the health effects of exposure to ozone, the proper location of air quality monitors, and whether the current carbon monoxide standard is justified, Senator Stafford asked why General Motors maintains that it "is right and everybody else is wrong."

In response, we want to point out that General Motors conducts extensive research on many issues of scientific interest, including, but not limited to, air pollution and its health effects. General Motors researchers are widely recognized in their fields and their work is generally respected. It is true that in some cases, the results of their research do differ from the "conventional wisdom," but this does not imply that their research is wrong or not worthy of consideration.

In some cases, over time, the General Motors view has been accepted by the scientific community and become "conventional wisdom." As an example, the role of NOx in inhibiting the formation of ozone under certain circumstances (the NOx inhibition effect), first discovered in the General Motors Research Laboratories more than two decades ago, has now been accepted to the extent that most computer models dealing with the effects of hydrocarbon and NOx reductions now incorporate this inhibition effect.

We believe the positions presented in my testimony on April 9 are similarly well-founded and will become increasingly accepted. Indeed, criticism of the placement of air quality monitors, similar to the concerns voiced by General Motors, was made by members of the House Energy and Commerce Subcommittee on Oversight and Investigations at the Subcommittee's April 27 House Energy hearing on the nonattainment problem.

I hope this information is helpful to the Committee as it struggles with the difficult issues presented by the ozone nonattainment problem. Although we at General Motors appreciate the dilemma faced by the nation and by noncompliance areas in particular, we do not believe stricter automobile emission standards are an appropriate or cost-effective way to deal with this problem. In addition, we do not believe that lower standards would significantly improve air quality.

Thank you for the opportunity to make these additional comments for the record.

Sincerely,

R.G. Sykes
for

Samuel A. Leonard
Director, Automotive Emissions Control

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Responses Submitted for the Record
of the April 9, 1987, Hearing on
Motor Vehicle Emission Standards and the Clean Air Act

Senator Chafee: "You keep referring to the four cylinder...what percentage of your automobiles are four cylinders?"

Response: Regarding General Motors production of 1986 model year cars, approximately 38% of these vehicles were equipped with four-cylinder engines.

Senator Stafford: "...So my question is: Why is it that NOx in-use performance is so much better than the other two, that is CO and hydrocarbon?"

Response: CO and HC emissions deteriorate in-use because to meet the very low 96% reduction standards for these emissions much of the control is accomplished by a catalyst. Catalysts deteriorate with age and use due to fuel impurities and thermal cycling. NOx control is partially accomplished in the combustion process by exhaust gas recirculation. However, for that portion of NOx control that is achieved through the use of a catalyst (rhodium is the catalyst used) the effectiveness does deteriorate as the vehicle is driven.

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CHRYSLER
MOTORS

Statement by Howard B. Padgham, Chief Engineer for Powertrain Engineering Programs, Chrysler Motors, before the Subcommittee on Environmental Protection, of the U.S. Senate Committee on Environment and Public Works, for the Hearing on "Potential Additional Controls on Mobile Sources Under the Clean Air Act."
April 9, 1987. Washington, D.C.

Thank you, Mr. Chairman, for inviting Chrysler Motors to testify at this hearing on "Potential Additional Controls on Mobile Sources Under the Clean Air Act." We are aware that the Committee's interest in mobile source emissions control is based on both the acid rain phenomenon and the problems associated with the creation of atmospheric ozone. It is Chrysler's view that the potential for additional improvements in tailpipe emissions from automobiles and trucks will result in only small, if any, measurable contributions to reducing these air quality problems. In the limited time available, I will address the three technical issues about which you requested comments for this hearing: (1) our experience with vehicle emissions certification data as it relates to in-use performance and recalls; (2) our views on the technological feasibility of tighter emission standards for light-duty trucks; and (3) our efforts to develop methanol-fueled vehicles.

Certification as it Relates to In-Use Performance and Recalls

Because our nation is dedicated to achieving healthy levels of air quality, and is paying a high price to do so, it only makes sense to assure that the standards new vehicles are certified to by the EPA are in fact being achieved "in-use." For this reason, Chrysler believes that reasonable "in-use" testing of vehicles is an important part of the mobile source emissions control program. The threat of vehicle recalls provides a very effective incentive for manufacturers to design and build vehicles with emission control systems that comply with the standards for their useful life (50,000 miles or 5 years for passenger cars, and 120,000 miles or 11 years for light-duty trucks). When you look at typical certification data, you will note that the emission values are well below the appropriate emission standards. This difference between the certification level and the standard represents a built-in safety margin to allow for production variations and, once in our customers' hands, to provide for the broad range of driving habits, fuel quality and maintenance practices that our vehicles are subjected to. Consequently, it is unreasonable to assume that certification emission levels can be used as an "in-use" standard. Even with a safety margin, our systems occasionally fail "in-use" testing and we are then subject to recall action. Clearly we have a large incentive to avoid this risk.

Tighter Standards for Light-Duty Trucks

On the surface, it would appear that there is room to further reduce exhaust emissions from light duty trucks. This is particularly true when one compares the lower levels of emissions required for California LDT's versus those required of 49 state vehicles. However, it is important to note that the 11 years/120,000 miles useful life required for 49 state LDTs is more than double that of California (which requires 5 years/50,000 miles). The result is that the 49 state vehicles are in effect subject to controls at least as tight as California's because of the necessity to build in greater in-use margins of safety. Tighter emission standards may be achievable in future years, but allowance must be made for sufficient time to accomplish that task, because if significantly more stringent standards are adopted, technological breakthroughs may be required.

Even for some of the changes made in vehicles from one model year to the next, new emission control system designs must be tested and this requires several years leadtime. For instance, durability testing of emission control systems for our 1989 model year vehicles was started in December of 1986; and designs for 1990 model year emission systems will soon have to be finalized. Without sufficient development leadtime, we will incur an unreasonably high risk in terms of recalls and in having to meet the warranty requirements of the Clean Air Act.

Finally Mr. Chairman, there is a significant debate underway over whether and how to control the Volatile Organic Compound (VOC) emissions that escape during the refueling process of light duty trucks and cars. EPA has estimated that these emissions represent only a 2% contribution to the VOC inventory. Yet, the Agency seems to be moving relentlessly toward requiring refueling emission controls. It is Chrysler's view that these controls are not a cost effective strategy.

Methanol-Fueled Vehicles

Chrysler supports the investigation and development of alternative fuels to reduce our nation's dependence on imported oil, and we believe methanol is the most likely alternative fuel. We also recognize the potential benefit of neat methanol fuels and vehicles in reducing vehicle emissions and improving air quality. Just three days ago, Chrysler presented its position to the

State of California in support of their investigation into these possible air quality benefits.

In Chrysler's methanol vehicle program over the past two years, we have designed and developed several dedicated M85 methanol vehicles. These cars have compression ratios of 11.5 to 1 in order to fully utilize the high octane of methanol for maximum power and fuel efficiency. The fuel system components are made of stainless steel or are nickel-plated to withstand the corrosive effects of methanol, and special elastomers are used. We believe our methanol cars are competitive with others that have been developed, and we look forward to further progress and eventual commercialization of this technology.

Although we believe this phase-in of methanol fuels is best accomplished through dedicated vehicles designed to take full advantage of the unique properties of methanol, we also support the investigation of flexible fuel vehicles (FFV) as an interim means to developing markets for methanol fuels and vehicles. In either case, however, building the sequence of events to a level necessary to sustain a viable methanol fuel and vehicle market will not be easy. Therefore, we support the principle of government leadership to provide incentives for making fuels readily available and for inducing the purchase of vehicles, providing those incentives do not undermine the intent of EPCA.

Conclusion

In conclusion, Chrysler is proud of its accomplishments in greatly reducing vehicle emissions, and we are continuing these efforts to develop furtherimprovements in emission control technology. We ask, however, that in considering new legislation you weigh the cost/benefits to society and recognize the substantial leadtime constraints we face as an industry.

Statement of
Donald R. Buist
Director, Automotive Emissions and Fuel Economy Office
Ford Motor Company
Before the Senate Subcommittee on Environmental Protection
April 9, 1987

Ford appreciates the opportunity to share information and provide views regarding what has been accomplished in reducing emissions from motor vehicles and how this relates to improvements in air quality and the attainment of National Ambient Air Quality Standards (NAAQS). In my testimony this morning, I will concentrate on Ford's role as a producer of motor vehicles, although we are also concerned with requirements that could affect our plant operations and costs. I'd like to begin by reviewing the status of the three ambient air quality standards which relate to emissions from motor vehicles -- nitrogen dioxide (NO_2), carbon monoxide (CO) and ozone. As the testimony will note, significant progress has been made in reducing air pollution, and further reductions will continue for years to come where motor vehicle emissions are a dominant factor.

Nitrogen Dioxide Ambient Standard

Highway vehicles presently account for about 35% of total NO_x (NO + NO_2) emissions into the atmosphere. Today's car and light truck NO_x emission standards, which represent a 75% reduction from uncontrolled levels, have had and will continue to have, a major impact in reducing ambient NO_2. Throughout the country, only portions of three counties in the Los Angeles area were not in attainment of ambient standards, despite a very substantial nationwide growth in vehicle usage.

CO Ambient Standard

Highway vehicle emissions are the primary contributors to ambient CO levels. Present car and truck standards require greater than 90% reductions from uncontrolled levels. As motor vehicle CO emissions have been reduced, so have ambient CO concentrations. Most areas are now in attainment, and most others are very close to attainment.

Ozone/HC

Control of motor vehicle emissions has contributed significantly to the virtual attainment of CO and NO_2 ambient standards. Attainment of the ozone standard has proven to be more difficult -- EPA indicates that 73 areas presently are not in attainment and 40 are projected not to reach attainment by the deadline. However, it must be emphasized that this has occurred despite a significant reduction in motor vehicle emissions.

Hydrocarbon control is the major strategy for attaining the ozone standard. Highway vehicles account for about 29% of reactive hydrocarbons. Present car and truck hydrocarbon standards require greater than a 90% reduction from uncontrolled levels. It is because of these stringent standards, in combination with more stringent future truck standards, that motor vehicles will continue to make a contribution to the reduction of reactive hydrocarbons and, in turn, ozone.

Motor Fleet Emissions Reductions

The average emissions from all motor vehicles in actual use -- from the smallest passenger cars to the largest trucks, including those which have been misfueled, tampered, or inadequately maintained -- show that the motor vehicle emission control program has been a major success. EPA data indicate that from about 1970 to the present, average vehicle HC emissions have come down by 72 percent, CO emissions by 67 percent, and NO_x emissions by 43 percent. By the year 2000, the cumulative reductions will have reached 86, 84, and 61 percent, respectively (see Attachment I). These reductions have occurred (or are projected to occur) despite the heavy incidence of tampering, misfueling, and poor maintenance, and the gradually declining influence of older, less stringently controlled vehicles.

Two of these adverse factors are expected to decline in the future. Today's control systems not only make tampering more difficult, but also reduce the incentive to modify vehicles because such tampering generally results in poorer driveability or fuel economy. Moreover, the elimination of leaded fuel will remove the most prevalent and damaging form of tampering. Removing these factors will allow us to realize the full potential air quality benefits of modern motor vehicle emission control systems, resulting in even greater emissions reductions than those cited above.

Certification and In-Use Emissions Levels

The letter of invitation to today's hearing asks for a discussion of emissions certification data, recalls, and in-use performance. I am glad for the opportunity to help put these various emission data sets into perspective. In order to do so, I am going to refer to three types of emissions -- certification, in-use, and in-use/recall.

The majority of certification testing is conducted a few months in advance of production (with durability testing occurring up to two years in advance). Because a single certification vehicle can represent many production vehicles, and because the testing precedes production; these vehicles must be built with components that have average performance characteristics, based on specifications to be used when production begins. In order to account for the variation of components in production, the variability of emissions testing itself, and the various ways that vehicles will be used by their owners, the emission controls must be designed to achieve certification levels much lower than the standards. For example, it is not unusual to see certification levels as much as 50 percent below the standard.

On the opposite end of the spectrum from the certification data are the actual __in-use__ emissions. Vehicles in customers hands are subjected to a variety of operating modes (including abuse), a variety of maintenance practices (including neglect), as well as tampering and misfueling. These worst-case operating modes, in many instances, significantly increase the overall emissions of the fleet. However, it is important to note that it is these worst case data which still yield the impressive motor fleet emissions reductions cited earlier (up to 86 percent reduction by the year 2000).

Between these two sets of data lie the __emissions/recall__ data. EPA conducts an extensive recall test program each year. In this program, the Agency eliminates from consideration any vehicles for which there is evidence of misfueling, tampering, or improper or inadequate maintenance. Occasionally, however, some vehicles fail this testing, usually due to the failure of some specific component. In those cases, the manufacturer conducts a recall to repair or replace the component.

The emission levels from vehicles in EPA's extensive recall program are at a much lower level than the unscreened in-use vehicles discussed earlier. This clearly illustrates that when vehicles are properly maintained and used, they perform essentially at design intent (i.e., the standards).

Impacts of Tighter Motor Vehicle Emissions Standards

Several Senate bills would propose tightening motor vehicle emissions standards. Some of the standards that have been suggested are clearly not achievable using known technology. Others would interrupt the steady progress which has been made in achieving low emissions levels and result in unduly compromised fuel economy, driveability and other customer satisfaction attributes. The magnitude of these effects will depend, of course, on the stringency of the standards. During the 1970's, consumers were very dissatisfied with vehicle emission control systems, which degraded driveability, fuel economy and performance. Today's customer is reaping the benefits of system design maturity.

With respect to NO_X, achievement of more stringent standards is dependent, in large part, upon increased use of rhodium in catalytic converters. This raises serious concerns. There are only two major sources of rhodium, South Africa and the Soviet Union -- both of which are subject to political uncertainties. There is increasing worldwide demand for rhodium, due to tighter California standards and new vehicle emission requirements in Europe. Rhodium is extracted from ores which contain small amounts of various precious metals, and to get one part rhodium, you must mine 19 parts platinum. So the question is what level of rhodium mining is economically practical and realistic. What's clear is that the rhodium demand is increasing, the price is increasing rapidly, and we are concerned the supply may not keep pace if more stringent NO_X standards are put in place.

The letter of invitation also asks about the technological feasibility of tighter standards for light and heavy-duty trucks. Light-duty trucks are currently required to meet HC and CO standards which, useful life aside, are based on a 90 percent reduction from uncontrolled levels, and NO_x standards representing approximately 75 percent control are scheduled for 1989. In addition to these stringent standards, EPA issued an advance notice of proposed rulemaking last fall, wherein the Agency stated its intention to propose even more stringent light-duty truck standards, purportedly "equivalent" to those of passenger cars. Taking into account the longer useful life of light-duty trucks, we believe the present "90% reduction" standards are already essentially equivalent to the passenger car standards in terms of stringency.

Turning to heavy-duty trucks which already meet stringent HC and CO standards, EPA has promulgated stringent NO_x and particulate standards for gasoline and diesel-powered trucks, which take effect between 1989 and 1994. We believe these standards represent the limits of technology, and may go beyond in some cases, especially in the case of the 1994 diesel particulate standard.

Even if the most stringent car and truck emission levels contained in the Senate bills were implemented, there would be a negligible improvement in total HC emissions compared with the emissions reductions which will automatically occur without further changes in the standards. These automatic reductions will occur due to changeover of the in-use fleet to the latest low emissions vehicles. For example, our analysis of EPA's estimates of in-use emissions indicates that between the years 1986 and 2000, the hydrocarbon emissions of the average vehicle in the motor fleet will be reduced an additional 56 percent _without_ new standards. Factoring in the most stringent HC standards in the various Senate bills introduced this year (.50 gpm for light duty trucks and .25 gpm for passenger cars), assuming for a moment that they are even feasible, only would improve the projected reduction in the year 2000 by one percentage point (see Attachment II).

This illustrates how little impact more stringent new vehicle standards have on the average vehicle emissions of the motor fleet. Further, because vehicle emissions account for less than one-third of ozone formation, reductions in these emissions offer limited leverage toward attaining the ozone standard. To demonstrate this fact, a study by Ford, using EPA air quality data, examined 20 cities that rank among the worst in terms of ozone attainment. The study indicates that even if passenger cars are eliminated from the road entirely, overall ozone would be reduced by only 20% on average in those cities studied, and half of those cities still would not achieve attainment.

Methanol

Ford believes that methanol may be a promising long-term replacement for petroleum-based motor vehicle fuels and may provide the potential for improving air quality. However, prior efforts to begin a transition to new motor fuels, such as diesel and propane, have not been widely accepted. Before methanol is considered as part of a clean air strategy, there are some important questions that need to be answered: 1) What degree of ozone improvement can reasonably be expected when methanol is not cost competitive with gasoline? 2) When can methanol be expected to be available, in sufficient quantity, and at a competitive price? 3) Are there other public health concerns related to use of methanol as a transportation fuel? 4) Are customers willing to accept methanol vehicles and the use of the fuel with regard to cost of fuel, vehicle cost, and basic mobility? Until these questions have been answered, and a supply system has been assured, methanol programs cannot move closer to becoming a production possibility. In spite of these serious concerns, Ford will continue its research efforts to eliminate many of the technical hurdles that remain for methanol-capable vehicles. To date, Ford has built over 600 prototype dedicated-methanol vehicles. These vehicles have accumulated 2.5 million miles in various fleets. The feedback from the field operators of these vehicles has been very positive.

We have now directed our attention to what we call the flexible-fuel vehicle or FFV. Our research goal with the flexible-fuel vehicle is to design a vehicle which could operate on either methanol or gasoline or any random mixture of those fuels -- automatically, without the need for the driver to take any action. The flexible fuel system requires a fuel sensor and associated control technologies to detect the exact composition of the fuel mixture so that the engine may be adjusted automatically to operate efficiently on this mixture. It is our belief that, initially, the flexible-fuel approach is the one to take, and we estimate that given four years lead time, a fully functional flexible-fuel system could be produced on one car line. Having noted the potential advantages of flexible-fuel vehicles, Ford has put 12 vehicles into service and has plans for 20 more.

Conclusion

Any further tightening of today's motor vehicle standards will have a very minor impact on achieving the nation's ambient air quality standards. Annual fleet turnover will continue the already impressive progress in reducing automotive emissions. With regard to the ambient standards for the three pollutants where automotive emissions play an important role, only ozone appears to be a major non-attainment problem. In areas where motor vehicles dominate, significant progress has been made. Achieving the ozone standard remains a difficult task in some areas, but motor vehicle emission controls could not solve the ozone problem even if such emissions were eliminated entirely.

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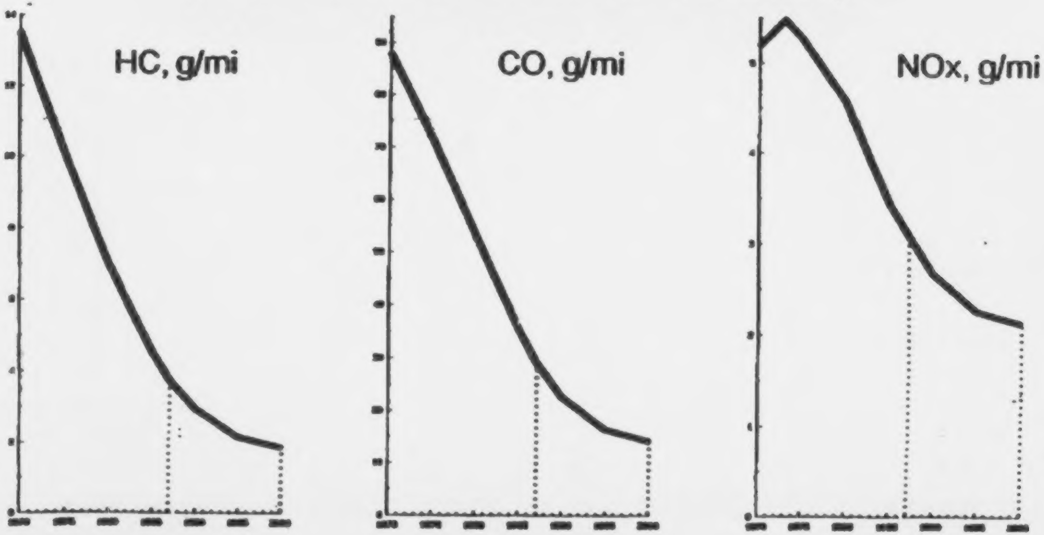
ATTACHMENT I

HISTORICAL AND PROJECTED MOTOR VEHICLE EMISSIONS REDUCTIONS

Average Motor Vehicle Emissions by Calendar Year.
Includes all cars, light – duty trucks, and heavy – duty engines (old and new, tampered and well – maintained).



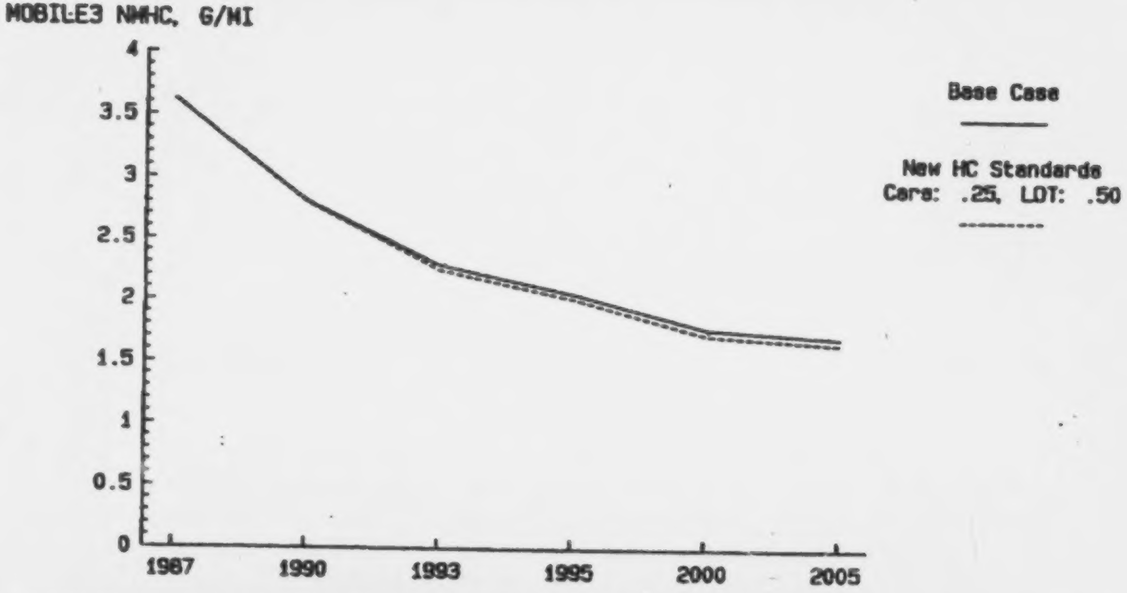
Total Hydrocarbons
1970 – 1987: Down 72%
1970 – 2000: Down 86%

Carbon Monoxide
1970 – 1987: Down 67%
1970 – 2000: Down 84%

Nitrogen Oxides
1973 – 1987: Down 43%
1973 – 2000: Down 61%

ATTACHMENT II

TOUGHER HC EMISSION STANDARDS WOULD HAVE NEGLIGIBLE IMPACT ON TOTAL FLEET EMISSIONS



AVERAGE MOTOR VEHICLE EMISSIONS BY CALENDAR YEAR: INCLUDES ALL CARS, LIGHT – DUTY TRUCKS AND HEAVY – DUTY ENGINES (OLD AND NEW, TAMPERED AND WELL – MAINTAINED)

CHRYSLER
MOTORS

Chrysler Motors Corporation

June 3, 1987

Senator George J. Mitchell
United States Senate
Committee on Environment and Public Works
Washington, D.C. 20510-6175

Dear Senator Mitchell:

This is in response to your letter dated May 8, 1987 which requested a written response to questions from members of the Subcommittee on Environmental Protection. These questions are in addition to those which were addresed at the Subcommittee hearing on April 9, 1987.

Our response is attached and we will gladly provide any additional information on mobile source emission controls that you may require.

Sincerely,

H.B.
H. B. Padgham
Chief Engineer
Powertrain Engineering
  Programs

HBP/ja

cc: Robert Perkins
    Vice President
    Chrysler Washington Affairs

CHRYSLER RESPONSE TO ADDITIONAL QUESTIONS BY THE SENATE SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION

Reference: Senator Mitchell's letter dated May 8, 1987

Question 1: 1987 certification data from the industry's prototype vehicles demonstrates that the gasoline light-duty engine technology is capable of bettering the existing carbon monoxide standard by over 40%, the hydrocarbon standard by 50%, and the oxides of nitrogen standard by over 60%.

Isn't technology currently available to meet and even exceed the existing standards?

Chrysler Response:

Using certification test data to predict the ability of vehicles to meet emission standards can be misleading because a variety of other factors can cause emissions to increase substantially above certified levels.

In reviewing the capabilities of the auto industry, it is essential to recognize that manufacturers must design emission control systems well-below the emission standard levels for HC, CO, and NOx. This is to assure that the vehicle will continue to meet the standards during its entire useful life (50,000 miles for passenger cars, and 120,000 miles for light-duty trucks). The difference represents a built-in safety margin to allow for unpredictable variations in driving habits, fuel quality, maintenance practices, and any of the other broad range of conditions to which vehicles are subjected during their useful life. Without that safety margin, large numbers of in-use vehicles would exceed the emission standards. Manufacturers would then be forced to recall most of their fleets and incur an expense, sometimes running into the tens of millions of dollars, to retrofit these vehicles with additional emission controls in an attempt to meet the standards. This risk would be greatly increased for passenger cars if the useful life is extended to 10 years/100,000 miles.

The auto industry has achieved impressive levels of control, with passenger car hydrocarbons already being reduced by 96%, carbon monoxide by 96%, and nitrogen oxides (which are more difficult to control) by 75%. This task was accomplished through the expenditure of considerable resources in order to solve a number of formidable technical problems. Having achieved this degree of control, we are continuing with the development and testing of improved systems. For instance, Chrysler is preparing to comply with the new California NOx standard of 0.4 g/mi that will be required of 50 percent of all passenger cars in 1989 model year and 90 percent through 1990-1993. This phase-in schedule, however, allows these vehicles to meet the higher 0.55 g/mi NOx standard in-use in view of the difficulty of achieving the very stringent certification standard for the entire useful life. We intend to increase the rhodium loading in the catalyst and calibrate the fuel metering system to richer fuel/air mixtures for improved catalyst NOx conversion efficiency. The richer calibration which is used with California's 7.0 g/mi CO standard, cannot be used at the Federal 3.4 g/mi CO standard. Currently, we know of no other hardware changes that would improve the effectiveness of car emission control systems. We are presently using state-of-the-art 3-way only catalysts with electronic feedback controls and fuel injection.

Tighter emission standards may be achievable in future years, but allowance must be made for sufficient time to accomplish that task. If significantly more stringent standards are adopted, technological breakthroughs may be required. For example, methanol-powered vehicles that may hold promise for lower hydrocarbon emissions are still in the research stage. Many obstacles must be overcome before they can be marketed in any meaningful quantity.

Even for some of the changes made in vehicles from one model year to the next, new emission control system designs must be tested and this requires several years leadtime. For instance, durability testing of emission control systems for our 1989 model year vehicles was started in December of 1986; and designs for 1990 model year emission systems will soon have to be finalized. Without sufficient development leadtime, we will incur an unreasonably high risk in terms of recalls and in having to meet the warranty requirements of the Clean Air Act.

Question 2: If one were to assume there was improved customer usage through better state inspection and maintenance and improved EPA enforcement through surveillance and recall, how much of an improvement in in-use performance would these strategies gain us?

Chrysler Response:

Improving state inspection and maintenance programs in future years would be expected to result in only limited benefits. The effectiveness of inspection/maintenance (I/M) testing, even with improvements, is expected to diminish in future years because:

- Catalyst tampering and poisoning are expected to decline as the result of the reduced cost advantage and availability of leaded fuel. Additionally, the reduced lead content of leaded fuel will minimize the likelihood of accidental contamination of the fuel distribution system, and thus the catalyst.

- The stable emission standards of recent years have permitted the refinement of the engine and emission control systems on today's cars. As a result, they have significantly fewer driveability problems than earlier generations of emission controlled vehicles. Thus, a major incentive for tampering has all but been eliminated.

- Fuel injected cars are much more difficult to modify and therefore are less likely to be the subject of tampering. In 1986, 66% of the cars built in the U.S. were equipped with fuel injection and the market share of fuel injected vehicles continues to increase each year.

- As experience is gained with the technology required to meet the current emission standards, the emission control systems are being refined to be more robust and less sensitive to owner abuse and improper maintenance.

- Because of time and cost constraints, an I/M test by its nature must be a relatively crude test when compared to an actual FTP test which costs several hundred dollars and requires more than twelve hours to conduct. As a result, the I/M type test is less effective as a failure identifier for today's lower-emitting vehicles.
- The above limitation will become even more apparent in future years as the fleet turns over and the proportion of lower emitting, more sophisticated, fuel injected vehicles increases.
- There is a limit to the extent that an individual's behavior can be controlled through regulatory programs such as state inspection and maintenance programs. Because of its inherent limitations, even an improved I/M test cannot be expected to detect, and thus contribute to correcting such things as abusive driving habits, use of improper oil or gasoline additives, inadequate oil change intervals, off-road vehicle usage or improper towing procedures, except in extreme cases.
- By alerting drivers of vehicle problems, the increased usage of on-board diagnostic systems on current and future vehicles should reduce the likelihood of vehicles being operated in a malfunctioning mode. The system also assists in the proper identification and repair of incorrectly operating vehicles.

Additional enforcement of the emission standards through increased testing by the EPA's Recall Branch would also be expected to result in little, if any, benefit. Chrysler is currently incorporating any new technology that will enhance the in-use performance of its vehicles as quickly as it is developed.

Increased surveillance and recall testing would in fact be counter-productive, since manpower and funds for in-use emissions development programs would be compromised by the need to use more of the corporation's limited resources to monitor and assist EPA's testing.

Question 3: EPA surveillance data even for "properly maintained" cars, according to the manufacturers' own recommended maintenance, indicates that on average the 1982-85 models in-use fail to meet the existing carbon monoxide and hydrocarbon standards at around 30,000 miles, well before the 50,000 mile useful life required by Federal law. Doesn't this demonstrate that customer usage is not the entire problem for in-use complaince?

Chrysler Response:

Surveillance vehicles are not representative of properly maintained and operated vehicles. Among past surveillance programs, EPA has included vehicles that had been the subject of tampering, had participated in competitive events, had used leaded fuel, had their timing mis-set by several degrees, or had never had their spark plugs changed despite being past the required maintenance point. Additionally, the EPA's selection process and the incentives offered to the owners, improperly skews the sample of vehicles tested. The information provided by the owners to identify properly maintained and used vehicles has also been shown to be unreliable.

Question 4: What measures will bring in-use vehicles into full compliance with the existing standards?

Chrysler Response:

Continued or expanded efforts to improve items such as public awareness, mechanic training programs, and fuel quality will improve in-use emissions.

Additionally, if emission standards remain stabilized at the current levels, manufacturers will be able to enhance the in-use emissions of their vehicles by continuing to refine the engine and emission control systems and implement improved technology, as it is developed.

Question 5: What is the amount of money, in dollars, that your company has spent on emissions control research, per year, over the past twenty years? What percentage of your company's total annual operating budget does this figure represent?

Chrysler Response:

The level of detail requested exists only for the 1979 to 1987 time period. The figures below show vehicular research and development costs as a percentage of Chrysler's total engineering R & D costs. These include design, development, and testing costs of systems to control emissions from our cars and trucks. They do not include costs for other types of environmental pollution control, nor do they include capital tooling, facility changes, or production costs. These engineering costs are shown below as a percentage of our total product development activity.

It should be recognized that any single cost will appear miniscule when compared to Chrysler's operating budget for all operations.

Year	Vehicular Emissions R&D Millions of Dollars	Emissions R&D as a percentage of product development operating budget
1979	24	7%
1980	23	8%
1981	17	7%
1982	18	6%
1983	19	5%
1984	21	5%
1985	21	4%
1986	22	4%
1987 (budget)	31	5%

Question 6: What efforts has your company made to develop and produce cars capable of burning alternative fuels? Please describe any such programs and their results in detail. When does your company expect to be capable of producing such cars on a commercial level?

Chrysler Response:

Chrysler developed and has produced propane vehicles for the Canadian market since 1981. Approximately 1500-2000 passenger cars and light-duty trucks are produced and sold in the Canadian market each year.

Chrysler is also investigating and developing methanol vehicle technology. Chrysler's first methanol demonstration vehicle was developed in 1985 using then-current technology. A second vehicle was launched in 1986 at Chrysler's Proving Ground for 50,000 mile durability testing to evaluate engine wear and materials compatibility with neat methanol fuel (M85).

The demonstrated success of these vehicles plus an interest in field testing methanol vehicles by Chrysler and the United States Departments of Energy and Defense led to a cooperative Chrysler/DOD Program in November, 1986. Chrysler provided the methanol-related vehicle components for the program based on our first generation 2.2L carbureted K-Body. The Belvoir Fuels and Lubricants Research Facility at Southwest Research Institute procured the vehicles, performed the retrofits, and they are currently overseeing the program at Randolph Air Force Base for the U.S. Department of Defense.

Having achieved our objectives with the first generation 2.2L carbureted K-Body, Chrysler developed two fuel-injected vehicles in April, 1986. In-house emissions, durability, and cold start testing continues on these dedicated 2.2L vehicles with multipoint fuel injection.

As a result of the growing interest in methanol and as a means of addressing the transition period between gasoline and neat methanol fuel availability, Chrysler approved work on a gasoline-tolerant methanol vehicle program in November, 1986. (A gasoline-tolerant methanol vehicle is designed to operate primarily on methanol, but can also tolerate or accommodate gasoline or any mixture of the two fuels.) Work on this program has revolved around defining a powertrain, engine mapping on the dynamometer, developing a fuel sensor, and investigating new materials and engine oil formulations required for the full spectrum of fuels. Chrysler's first two gasoline-tolerant methanol vehicles are scheduled to be built early this summer.

Due to the numerous problems which must be resolved prior to full-scale production of neat methanol vehicles, Chrysler believes the earliest date for limited production of these vehicles is sometime in the mid-1990's.

Question 7: Has your company completed or is your company currently conducting any research assessing the environmental effects of emissions from alternative fuels, including methanol? Please describe the results of any such research.

Chrysler Response:

Chrysler has not conducted any research assessing the environmental effects of emissions from alternative fuels. Chrysler has relied on studies conducted by the EPA, CARB, various universities, and other organizations. We have, however, conducted tests on our methanol-fueled vehicles to determine the effects on emissions.

TESTIMONY OF
TOYOTA MOTOR CORPORATION

PRESENTED TO THE

ENVIRONMENTAL POLLUTION SUBCOMMITTEE
OF THE
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

UNITED STATES SENATE

April 9, 1987

I. INTRODUCTION

Good morning. My name is Teiji Iida, I am manager of Toyota Motor Corporation's Washington, D.C. office. This morning I am accompanied by Richard Penna, of the law firm Schnader, Harrison, Segal and Lewis. Mr Penna is registered as a "foreign agent" pursuant to the Foreign Agent Registration Act. On behalf of Toyota Motor Corporation (Toyota), I want to thank the Subcommittee for providing Toyota the opportunity to express its views on mobile source related issues under the Clean Air Act.

In March 1967 Toyota had the distinction of receiving the first certificate of conformity issued to a vehicle manufacturer under the Clean Air Act for our Tiara and Land Cruiser vehicles. This fact has been a source of encouragement to Toyota and has stimulated our efforts to comply with vehicle emission control standards. Toyota is proud of the record we have achieved regarding compliance with emission standards under the Clean Air Act. We have not had any emission recalls since we began importing vehicles into the United States. Toyota has been making every effort to continue this level of performance, and we promise to keep up these efforts in the future.

We recognize that the existing U.S. emission standards are the most stringent in the world. In order to comply with these stringent requirements, Toyota has conducted extensive research and development programs. We believe these efforts have led to the production of high quality vehicles. We take great pride in the quality of Toyota vehicles. Toyota believes part of overall vehicle quality is emission performance.

Toyota has several concerns with portions of bills that have been introduced this year to amend the Clean Air Act. These are: a provision which would require the imposition of "on-board" refueling control systems on vehicles, and proposals to make HC and NOx tailpipe emission standards more stringent.

Before discussing the detailed technical reasons for Toyota's concerns, it is appropriate to keep in mind the progress that has been made in controlling emissions from all classes of mobile sources. Not only has the percent reduction of HC, CO and NOx emissions from the tailpipes of passenger vehicles been reduced by 96% and 75% respectively, but emissions from light trucks have also been reduced by nearly equivalent percentages. The progress made in reducing emissions from vehicles is also reflected in the rapid decline in the contribution of mobile sources to total HC and NOx emissions. The most recent EPA Emission Trend Report shows that mobile sources account for approximately 35% of national NOx emissions and 28% of HC emissions. Put another way, other sources now account for a large majority of HC and NOx emissions. This represents a major reversal in these percentages from a decade ago, when mobile sources accounted for nearly 70% of the HC and 60% of NOx.

Toyota believes the single, most effective control measure to continue the progress in reducing emissions from mobile sources is the replacement of older vehicles with newer vehicles that meet today's emission standards. Due to the reductions in vehicle emissions already achieved, any proposals to tighten existing standards or to impose new control requirements will achieve very small incremental percentage reductions over what would otherwise occur from normal vehicle replacement. In addition, the small incremental reductions that may be achieved if additional requirements are imposed will not be realized for a long period of time. This is due to the lead time necessary for design and testing of the necessary modifications and the 12-15 years needed to turn over the existing fleet of vehicles. The small reductions that may be achieved will be very costly and will present significant engineering challenges.

II. SPECIFIC COMMENTS ON LEGISLATIVE PROPOSALS

A. Vehicle Refueling Controls

One of the bills introduced in this Congress contains a provision which would require the imposition of so-called "on-board" refueling control systems on vehicles by model year 1989. Toyota believes on-board controls are unwise and should not be required. There are four reasons for this view. First, the installation of a large, complex new system creates design and location problems especially in the case of smaller vehicles that are likely to require substantial redesign efforts. Second, there is great uncertainty over the design and performance of on-board systems when in the hands of vehicle owners. Third, the lead time provided in this proposal is virtually nonexistent. With adequate lead time and allowing for normal fleet turnover, reductions will not be available for many years. Fourth, the cost of on-board systems is very large in comparison to the possible reductions. Each of these points will be discussed in greater detail.

1. Packaging

As I am sure the Subcommittee is aware, Toyota, like other vehicle manufacturers, attempts to design vehicles utilizing the most up-to-date techniques so that the most effective utilization of available space can be employed. As Figure I shows, on-board systems will be quite complex, and consist of much more than an enlarged evaporative canister. New valves, switches, vapor lines, a liquid/vapor separator and seals will be required, in addition to a 6-8 liter canister.

The photographs on Figure II show the engine compartment on several 1987 Toyota models. In addition, we have a 1987 Cressida, Toyota's largest U.S. model, available for inspection after this hearing. Even in that vehicle, there is no room in the engine compartment for the vastly enlarged canister and other equipment. I have asked my staff to construct a life-size model of a canister that is being tested by Toyota at this time. As you can see it is very large, and it cannot possibly fit in the engine compartment of our vehicles. Figure III is a photograph of the actual canister assembly.

If the system cannot be placed in the engine compartment, it must be placed in the rear of the vehicle. This will require re-design of major components of the vehicle body. Figure IV shows a sketch of the floor pan of one of our existing models. Figure V shows how this floor pan must be changed to accommodate the canister. Mr. Chairman, my background is in body structure engineering. I can verify that the floor pan is one of the longest lead time items to change due to the fundamental role the floor pan plays in the structural integrity of the vehicle, the effect of any change on the suspension system and the complexity of retooling.

The redesign of the body will lead to either the loss of luggage/cargo space or fuel tank capacity. Figure VI shows the luggage capacity of one of our existing 1987 models. The base vehicle is capable of carrying three large bags, the vehicle modified to simulate an on-board refueling system can carry only two. A similar loss of fuel tank capacity will diminish the driving range for vehicles by 10-20%. In a vehicle which can now travel 350 miles between refueling, the owner would be forced to refuel at 280-300 miles. Indeed, on vehicles with smaller fuel tanks the distance between refueling could be reduced to 200 miles or less. Market experience with vehicles which have short driving range indicates that consumers are greatly inconvenienced by the more frequent need to refuel. Under either design option, the utility of the vehicle will be diminished.

2. Unresolved Technical Issues

Toyota's testing program for on-board systems has shown that purging the gasoline vapors from the canister to the engine is a problem. We have found that there are emission and driveability problems due to the large amount of vapor that must be sent to the engine. The metering of these vapors must be precise, in order to meet the existing tailpipe emission standards. Our testing up to this point has shown that we cannot combine the purging system used for the existing evaporative canister with the refueling purge system without having unacceptable results.

Toyota's carbureted vehicles will not be able to accept the additional vapors without the addition of an electronic computer for purge control and a vapor switching valve. Even with these devices, we cannot now be certain that acceptable emission performance and driveability can be achieved.

Given the difficulty we can anticipate meeting existing tailpipe standards with on-board controls, meeting a more stringent HC standard, such as that contained in S.300, may be beyond the limit of existing emission control technology, particularly if on-board controls are required.

Finally, system maintenance is a major concern. Since it is likely that this system will be located in the rear of the vehicle, it would be much more susceptible to salt, corrosion, mud, dirt and road hazards than if it were placed in the engine compartment. The system must take in air in order to purge, and methods of air filtration is a factor that must be carefully evaluated. For these reasons, we must design all system components to be very durable because they will be operating in a more hostile environment. If the useful life is raised as proposed in S.300 and S.321, the system maintenance problems will be even more severely increased.

3. Leadtime

In addition to the redesign of major structural components of the vehicle, which were discussed above, the fuel system of the vehicle must undergo a major change. Fuel lines must be re-routed, a liquid/vapor separator, additional switches, valves and seals must be added and a new, large-diameter vapor line must run from the canister to the engine. The combination of major structural changes as well as a redesign of the fuel system raises concerns about compliance with Federal Motor Vehicle Safety Standard 301 (fuel system integrity). Figure VII shows the type of destructive test performed to assure compliance with this safety standard.

Substantial crash testing will be required before final design and tooling can begin. The reasons for this are both to assure occupant safety and to avoid being required to make major changes in components or structures after production has begun.

Toyota estimates that in order to reduce the high costs associated with "crash-project" re-design of structural components, at least 6 years lead time must be provided prior to any requirement for these systems on all vehicles. For certain models a few additional years may be required. If this lead time is added to the time necessary for fleet turnover, it can be seen that the full (albeit, small) reductions associated with on-board control will not be achieved for 15-20 years.

4. Cost Considerations

EPA has used cost estimates of $19 per vehicle with a $5 credit for increased fuel economy. Toyota believes the EPA cost estimate is greatly understated. Based on estimates received from our suppliers, and taking into consideration the high level of durability that Toyota feels is necessary due to the location of such systems, the cost of these systems is in the range of $80-115 per vehicle.

Toyota believes EPA's figures underestimate the cost of the activated carbon needed to absorb the gasoline vapor, as well as the cost of the valves, seals, etc. In addition, EPA has not considered the costs of shielding, corrosion protection or crush protection for these systems.

Due to the technical, cost and lead time concerns addressed above, Toyota respectfully requests the Subcommittee to reject any requirement to impose on-board controls on vehicles.

B. More Stringent Emission Standards.

Several bills introduced in this Congress contain proposals which would tighten existing tailpipe standards for passenger vehicles and light-duty trucks. Toyota's policy concerns about these proposals are addressed above, therefore these comments will focus on technical issues associated with meeting certain proposed standards.

Before discussing specific proposals, it is appropriate to discuss several general points regarding emission levels of certification vehicles and in-use vehicles. In general, in-use deterioration, variability in emission performance between production vehicles, and other in-use factors such as use under severe driving conditions are the reasons which lead manufacturers to provide a "margin-of-safety" in certification levels. The amount of the "margin-of-safety" may vary from manufacturer to manufacturer, and is a policy determination to be made by each manufacturer.

The vehicles with lower base emission levels (i.e., lighter vehicles, manual transmission vehicles, etc.) emit less tailpipe emissions than others due to the fact that the same emission control system is installed on them as other vehicles in order to reduce manufacturing complexity.

It should also be noted that there is variability in emission results from test-to-test and from test vehicle-to-test vehicle on the federal test procedure ("FTP"). This variability should not be relied upon to show that vehicles can achieve lower emission levels than existing standards. Due to this variability, manufacturers are conservative in their certification programs.

In the certification test, one durability vehicle and two emission vehicles, which represent each engine, are tested and evaluated in accordance with EPA specified procedures. However, because of the numerous operating conditions encountered in the market, as well as production variability, all the in-use vehicles cannot be represented by the 3 vehicles tested. Therefore, vehicle manufacturers must attempt to certify below the standard in order to assure compliance with applicable standards for in-use vehicles as required by the Clean Air Act. If emission standards are reduced, manufacturers would be required to even further lower certification test levels in order to achieve the same "margin-of-safety" as today.

Toyota's experience with the data obtained from the past in-use surveillance tests show that the emissions level of in-use vehicles is higher than certification vehicles. However, it should be noted that in-use surveillance test data is affected by such factors as misfueling and failure of maintenance by users that have adverse effect on emissions levels.

With the information regarding the relationship between certification and in-use emission levels in mind, I will now turn to technical comments on the proposals to tighten certain emission standards.

1. Existing California NOx Standard And Federal HC and CO Standards (50 State Standards)

In the tuning of the three-way catalyst system at rich side of the air-fuel ratio, NOx emissions are reduced and HC/CO emissions increase; and at lean side, NOx increases and HC/CO are reduced. The 7.0 g/mi CO standard in California makes it possible to meet California NOx standards in Toyota's carbureted vehicles. However, Toyota's carbureted vehicles cannot meet 0.41 HC, 3.4 CO, and 0.7 NOx standards due to the phenomena mentioned above. Therefore, we separately certify certain California and federal (49-state) vehicle models. In order to certify certain models for sale and use in all 50 states, we use the more expensive electronic fuel injection ("EFI") system which has the ability to optimize NOx, HC, and CO control. Five engine families were certified to meet 50 state standards for Model Year 1986.

2. Future California NOx Standard (0.4 g/mi) Together With Existing Federal HC and CO Standards (S.321)

It is very difficult to meet the NOx 0.4g/mi standard at the production stage. However, we are making efforts to comply with the standards above. The major problems we are experiencing involve production variability of vehicles and in-use deterioration. Toyota is attempting to improve mass-production processes to reduce variability in emission performance in production vehicles. In addition, we are attempting to develop emission control systems which have less deterioration.

The amount of rhodium used in Toyota's catalysts has reached the saturated level to reduce NOx emissions. In order to meet the NOx 0.4g/mi standard, the addition of more rhodium, by itself, will not assure compliance with this standard. It should also be noted that the in-use level set by California is 0.55 g/mi. This indicates the difficulty manufacturers face in achieving the low NOx standards in actual customer use.

3. S.300 Standards -- 0.25 HC, 3.4 CO, 0.4 NOx

As discussed above, there is a relationship between HC, CO control and NOx control. The levels in S.300 would pose a very complex set of problems for Toyota. At this time we are uncertain how these levels can be met or when they can be met. As stated above, the task of meeting such low standards will be made even more complex if on-board controls are required.

Due to extremely low emission standards, and the extended useful life proposals in both S.300 and S.321, certification levels would need to extremely low in order to have any possibility of avoiding in-use noncompliance.

4. Light-Duty Truck Standards S.300

S. 300 contains extremely stringent proposals for light-duty truck emission standards. The proposed NOx standard is more stringent than the existing passenger car standard, the proposed CO standard is one-half the existing truck standard, and the proposed HC standard is nearly a 40% reduction from the existing HC standard. Since trucks are designed to operate with heavy loads, emission control systems must be capable of operating under quite severe conditions. A further complicating factor is the trade-off between HC/CO control and NOx control, particularly under heavy load conditions.

Toyota believes that at a minimum, electronic fuel injection must be added to all trucks. In addition, for NOx control additional precious metal loading and engine modifications will be needed. However, even with these expensive modifications, Toyota cannot be certain that all 3 standards can be met simultaneously. Further design and testing will be required to determine the additional changes that would be made to the engine/emission control system in order to meet these standards.

5. Methanol Fueled Vehicles

Toyota is conducting research and evaluation of experimentally produced Otto-type (non-diesel) methanol vehicles.

The prospect of practical use of methanol vehicles is still far from certain because of problems such as clogging of the fuel injector nozzle and lower durability of the engine itself and fuel system components.

Therefore, Toyota has no specific time schedule for producing methanol vehicles. More definite plans will be developed as the technical problems referred to above are resolved, and after the adequate supply of this fuel is available to support the production of such vehicles.

III. CONCLUSION

Toyota thanks the Subcommittee for inviting it to testify. We pledge to continue to work diligently on emission control matters. We sincerely hope the Subcommittee will carefully consider the policy and technical issues raised in this testimony. We will be happy to respond to any questions the Subcommittee may have at this time or in the future.

TESTIMONY

to the Senate Committee
on Environment and Public Works
on Attainment of National Ambient
Air Quality Standards

Submitted by

Cummins Engine Company, Inc.
April 9, 1987

Mr. Chairman and members of the Committee, my name is Dr. John Wall, and I am Director of Emissions Research for Cummins Engine Company, Inc., headquartered in Columbus, Indiana. Our major products are diesel engines and engine components, used primarily in heavy-duty truck, construction, marine, industrial, and defense applications. I appreciate the opportunity to appear before you today.

We have been asked to testify on major issues regarding diesel emission controls, particularly as related to the attainment of National Ambient Air Quality Standards. I would first like to affirm Cummins' support of air quality standards and of the legal process by which they are established and enforced in our country. It is properly the responsibility of Government to develop appropriate ambient air quality standards, and to design a fair and practical system for meeting these standards by setting limits for emissions from the various contributing sources.

Diesel engines have some advantages and some disadvantages compared to gasoline engines in controlling emissions. Because of the physics and chemistry of diesel combustion, carbon monoxide and gaseous hydrocarbon emissions from diesel engines are very low. On the other hand, NOx and particulate emissions are more difficult to control.

A new issue that has been recognized with regard to diesel emissions is that of sulfate formation -- both as a component of particulate emitted directly from the engine, and as sulfate particulate formed in the atmosphere from gaseous SO_2 in diesel exhaust. This sulfate particulate formed in the atmosphere accounts for the bulk of particulate derived from diesel engines. I would like to refer to several figures which illustrate the effect of fuel sulfur on diesel emissions.

Figure One shows the composition of diesel particulate as collected from an engine during the EPA Heavy-Duty Transient Emissions Test Procedure.(1) This figure represents diesel particulate at the 1988 standard of 0.6 g/bhp-hr. About 20% of the particulate is composed of sulfate, about 10% comes from the engine lubricant, and the rest is caused by incomplete combustion of the fuel. The fuel hydrocarbon and engine lubricant contribution to particulate can be reduced by engine design changes, and to a lesser degree by fuel and lubricant modifications. We know of no way to reduce direct sulfate emissions from diesel engines except to reduce the sulfur content of diesel fuel.

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(1) This procedure requires the engine to be exercised over a specific operating cycle, during which the exhaust is diluted with clean air (to simulate dilution in the atmosphere as it leaves the tail pipe) and then filtered to collect the particulate.

Figure Two illustrates how the composition of the particulate must change if we are to meet future particulate standards. On this graph, we have shown the legal standards in green, and lower "design targets" in red. These design targets are the new engine emission limits required to ensure that at the end of the useful life period -- which is 290,000 miles for the largest heavy-duty diesels -- these engines will still comply with their emission standards.

As you can see, because of the sulfate contribution to the particulate, the total hydrocarbon contribution from fuel and lubricant must be reduced for 1991 heavy-duty engines to the current level of the lubricant contribution alone. This is likely to require the use of exhaust aftertreatment devices ("particulate traps"), which will add substantially to the cost and complexity of the engines. For 1991 urban bus engines and all 1994 heavy-duty engines, total elimination of the hydrocarbon contribution from fuel and lubricant would still not allow us to meet required new engine particulate levels. In order to meet these standards, fuel sulfur reduction is mandatory. The true impact of fuel sulfur on the total atmospheric particulate burden, however, is far greater than the sulfate contribution to engine emitted particulate emissions.(2)

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(2) The bulk of the fuel sulfur (about 97%) is emitted as gaseous SO_2 in the exhaust, and approximately 50% of the SO_2 is converted in the atmosphere to sulfate particulate.

Figure Three illustrates the relative magnitude of directly emitted particulate, and particulate formed in the atmosphere from SO_2 emissions. At the engine particulate levels of the 1991 standards (0.25 g/bhp-hr), the particulate formed by atmospheric reactions from SO_2 is six to seven times the particulate emitted directly from engines. All of the atmospheric sulfate falls into the under 10 micrometer range covered by the proposed PM10 ambient air quality standards, for which many areas are expected to be in non-attainment. Atmospheric sulfate can only be reduced by reducing fuel sulfur.

We have presented this evidence to the EPA, and it has been confirmed by the EPA staff in Ann Arbor. Furthermore, independent analyses by diesel engine manufacturers, petroleum companies, EPA and California Air Resources Board have shown fuel sulfur control to be the most cost-effective approach to reduce diesel-derived atmospheric particulates. Fuel sulfur control would also make it far more likely that diesel engine manufacturers will be able to meet 1991 heavy-duty engine particulate requirements (0.25 g/bhp-hr).

In the final analysis, a complementary strategy of fuel sulfur control to reduce sulfate emissions, and engine modifications to reduce carbonaceous particulate emissions, appears to be the most cost-effective and sensible solution.

We have requested the EPA to exercise its authority under the Clean Air Act to regulate the sulfur content of diesel fuel through the established standard-setting process. The Engine Manufacturers Association also supports this request. We are confident that EPA will take action on this issue because:

- the reduction of sulfur content of diesel fuel is critical to our ability to meet the promulgated standards;
- it is the fastest and least costly way to reduce the total level of atmospheric particulate associated with diesel operation;
- and, in fact, it is the *only* way to reduce particulate formed in the atmosphere from SO_2 emissions.

Finally, I would like to turn to the related issues of durability, reliability, and compliance with respect to emission control technology, and, in particular, exhaust aftertreatment devices, commonly known as "particulate traps." In the past six to eight years, there has been a substantial industry-wide effort to develop a viable particulate trap for use as part of our emission control strategy. This requires development of a totally new technology, which has exhibited the typical fits and starts of any new development. The criteria for success are formidable -- among them: durability of up to 290,000 miles in rough service, safety, reliability, minimum impact on fuel economy. The current level of sulfur in the exhaust greatly complicates the task of developing an effective exhaust aftertreatment system.

Our industry has historically demonstrated the ability to produce solutions to emissions control requirements that not only satisfy emissions regulations, but also result in generally improved performance of the product. We have not yet achieved this with exhaust aftertreatment devices, nor may we ever. The current unreliability of this technology and added cost of operation would create strong incentives for tampering. This would produce a situation in which the technology simply would not be effective, or would impose great additional costs on the public, or both.

The complementary particulate control strategy we have proposed -- fuel sulfur reduction for sulfate control, and engine modification for carbonaceous particulate control -- if implemented in time for 1991 engine certification, will distribute the responsibility for diesel particulate control in the most cost-effective way, and will help us to continue to serve the public by producing power units that meet the highest standards of performance and environmental responsibility.

Thank you for this opportunity to present these thoughts to you today. I will be pleased to attempt to answer any questions you may have.

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STATEMENT

OF THE

MANUFACTURERS OF EMISSION CONTROLS ASSOCIATION

BEFORE THE

SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

SUBCOMMITTEE ON ENVIRONMENTAL POLLUTION

HEARING ON

"POTENTIAL ADDITIONAL CONTROLS OF MOBILE SOURCES UNDER THE CLEAN AIR ACT"

APRIL 9, 1987

I. INTRODUCTION

The Manufacturers of Emission Controls Association (MECA) is pleased to present testimony to the Senate Subcommittee on Environmental Pollution at its hearing on "Potential Additional Controls on Mobile Sources Under the Clean Air Act." We commend the Subcommittee for its efforts to address the serious air pollution problems currently confronting this nation. Legislation eventually passed by this Congress reauthorizing the Clean Air Act will establish the framework for the control programs that will determine the quality of the air we breathe well into the next century.

MECA is a non-profit association of companies that manufacture various motor vehicle exhaust emission controls. Our membership includes companies with extensive experience and a proven track record in the development and application of catalytic converter and diesel particulate trap oxidizer technology.

The United States mobile source emission control program created in 1970, when Congress established technology-forcing standards which fostered the development of new technology, is the most successful air quality control program in the world. Motor vehicles on the road today emit substantially less pollution than vehicles of the 1960's. At the same time, fuel economy has nearly doubled, and vehicle performance has not suffered. Our companies are proud of the role they played in making the control program a success.

This pride in our past contributions, however, does not keep us from recognizing that the issue before the Subcommittee is not which sources have or have not controlled emissions in the past, but what reductions can be achieved from all sources -- stationary and mobile -- to help address this nation's serious air quality problems. It is in that spirit that our companies continue their efforts to develop and refine emission control technologies and in which we offer the comments presented below.

- Legislation has been introduced and referred to this Subcommittee which would establish standards of 0.25 gpm HC, and 0.4 gpm NO_x for passenger cars while retaining the current 3.4 gpm CO standard. While we are mindful of, and do not wish to understate, the technological challenges involved in meeting such standards, we are optimistic that with further development and refinement of well understood control technologies and reasonable lead time, these standards would be achievable.

- The greatest engineering challenge to complying with more stringent emission standards is maintaining the durability of controls systems in use. We believe that (1) improvements in catalyst design, either in existence or under development, (2) utilization of multi-point fuel injection and other engine improvements, and (3) a declining presence of trace lead in unleaded gasoline make the prospects for developing durable systems excellent.

- More stringent state operated Inspection and Maintenance (I&M) emission testing programs, increased utilization of emission control equipment inspection programs, and tougher tampering restrictions would greatly help preserve the effectiveness of emission control systems in use by encouraging consumers to better maintain, fuel, and operate their vehicles. Improving these in-use emission control programs could have a major impact on air quality by reducing the level of pollutants emitted by existing motor vehicles in use.

- Significant advances in diesel particulate control both through engine modification and exhaust treatment devices continue to evolve which will greatly reduce particulate emissions. These advances will only continue, however, if regulatory requirements exist which create the incentive to develop such technologies.

II. MORE STRINGENT GASEOUS EMISSION STANDARDS FOR MOTOR VEHICLES

Technological Feasibility. More stringent gaseous emission standards for motor vehicles have been, and will be an important part of, legislation introduced and referred to this Subcommittee. For example, legislation has already been proposed that would tighten passenger car emission standards to 0.25 gpm HC, and 0.4 gpm NO_x while retaining the existing 3.4 gpm CO standard. We believe that with further development, refinement, optimization and utilization of emission control technologies, either existing or under development, and with adequate lead-time, such standards would be technologically feasible. In reaching this conclusion, we note that the final technical solutions would not simply be a better catalyst, but rather a complete system with advanced catalyst designs and improved engine fuel metering designs such as increased utilization of multi-point fuel injection and quick responding closed loop control of air/fuel metering.

Preliminary and unofficial 1987 EPA emission certification test results, which are based on 50,000 miles durability aging, illustrate that progress in reducing emissions is already taking place. For example, approximately 50% percent of the engine families certified below a .25 HC, 3.4 CO, and .4 NO_x level. It should be kept in mind in considering the certification data that manufacturers typically engineer systems to ensure that vehicles in certification meet standards by a comfortable margin. Nevertheless, the certification test results provide an important indication of what can be done.

A number of promising approaches have been or are being developed which could achieve greater NO_x and HC control than currently required. Some companies are working on such advanced concepts as a warmup catalyst which would improve HC control at low temperatures when the vehicle engine is started. Our companies have developed or are developing advanced catalyst formations to improve emission control efficiency. New generation three-way catalysts, for example, feature open porous surfaces more resistant to performance deterioration and incorporate some materials which enhance the active catalyst performance.

Proper performance of these catalysts is dependent on the system in which it operates. Three-way catalysts will operate more system. The multi-point fuel injection system used by European auto manufacturers is an example of such a system. Domestic manufacturers have also introduced such systems. A California Air Resources Board staff study of the feasibility of tighter HC standards for light-duty vehicles identified the technological developments discussed above as a means to meet tighter standards, as well as other engine system features such as fast burn combustion chambers, improved O_2 sensors to last 50,000 miles, and improved ignition systems.

We believe that the advances in catalyst designs and other improvements in the overall emission control systems being applied today primarily for use in passenger cars can be applied to other classes and categories of motor vehicles as well.

__Rhodium Supply__. Rhodium is an important element in controlling NO_x emissions from motor vehicles, generally using more rhodium will improve NO_x control. However, it remains an open question how much, if any, additional rhodium would be necessary to meet more stringent standards. First, the degree to which advanced engine designs such as the increasing utilization of multi-point fuel injection will influence the amount of rhodium necessary is uncertain. Second, catalyst manufacturers are working to develop improved catalyst and washcoat designs which will permit the same or a greater degree of NO_x control while using less rhodium than is found in converters of new model year automobiles on the road today.

One example of the newer three-way catalysts was reported in a

Society of Automotive Engineers technical paper entitled "Effective Rhodium Utilization in Automotive Exhaust Catalysts" (SAE No. 860566) in which the authors, who are experts in the field of catalysis, reported that:

> "By keeping the Rh (rhodium) segregated from the rare earth components; and the particle size of the Rh species to an optimal size to minimize Al_2O_3 support interactions, the TWC (three-way) catalyst can be made to be more tolerant to high temperature lean excursions.
>
> By designing the Rh function in the catalyst to be more thermally stable; and with the prospects of less poisoning from Pb (lead), the Rh content of "High Tech" catalysts can be reduced."

Development work is underway to change the ratio of platinum to rhodium from the historic level of 5 to 1 to approach the ratios typically found in existing mines (19.5 platinum to 1 Rhodium). Some vehicles already are equipped with catalysts using a 10 to 1 ratio.

Another technological development underway is to further reduce precious metal loadings by utilizing base metals in catalysts. Closed loop stoichiometric operation with today's relatively clean fuels improves the prospects of reducing precious metal usage with the addition of base metals. Several companies have initiated research programs to develop this technology. Base metals likely will only substitute in part for precious metal usage and this technology likely would not be available until the mid 1990's, but if successfully developed, it should reduce the demand for rhodium.

Recycling rhodium from three-way converters of post-1980 automobiles which are no longer in operation eventually will be a significant source of rhodium. Chemical processes exist to recover a high percentage of the rhodium contained in these converters. In several years when a significant percentage of the early 1980's automobiles will be taken out of operation, the supply of recycled rhodium will begin to increase dramatically.

Durability. The most serious engineering challenge to meeting more stringent emission standards is to maintain emission control performance during the useful life of the vehicle under real-world operating conditions. We believe prospects for resolving this engineering challenge are excellent.

For the catalytic converter, the primary engineering challenge is maintaining conversion efficiency in a hostile environment in which the catalyst is sometimes subjected to extremely high exhaust temperatures as well as exposed to contaminants from the fuel (e.g., lead) and oil (e.g., ash). Substantial advances in catalyst design have been made since catalytic converters were first introduced in 1975; indeed many of the catalyst designs found on 1987 model year vehicles are superior to those found on vehicles sold in the early 1980's.

Our companies have developed, and are continuing to develop, improved catalyst supports (substrates), washcoats, and catalyst formulations which are better able to withstand exposure to the extremely high temperatures sometimes experienced in vehicle operation (particularly if the vehicle has been improperly maintained or operated). For example, work is continuing to develop catalyst supports (substrates) with greater resistance to melting than the material used in the majority of today's catalytic converters. Also, companies have developed and are working on new washcoat materials that are more resistant to sintering at high temperatures.

Work is also under way to make catalyst systems more resistant to contamination. For example, research is taking place to develop washcoat materials with better porosity and to develop methods of chemically bonding the contaminates such that they do not effectively poison the precious metal active sites.

In addition to improvements to the catalyst itself, other developments are occurring which should improve in-use catalyst performance. First, as noted by the Air Resources Board in the study referenced above, improvements to the fuel control and ignition systems will better regulate the engine operating conditions permitting the catalyst to function in a more controlled environment, thereby improving catalyst performance. Other engine improvements help reduce engine emissions generated by malfunctions. Second, and very important, the level of the principal contaminate contributing to catalyst deterioration in-use -- lead -- is decreasing in unleaded gasoline. Fuel surveys conducted by the Motor Vehicle Manufacturers Association show, for example, that the percent of unleaded gasoline samples surveyed with lead levels of 0.005 grams or greater declined from over 90% in the summer of 1980 to less than 5% in the summer of 1985. Such reductions in trace lead levels in unleaded gasoline will have an extremely positive impact on increasing catalyst durability. Indeed, if EPA would finalize its proposed ban on leaded gasoline, or if Congress were to enact a lead ban as part of Clean Air Act Reauthorization legislation, lead contamination of unleaded gasoline would quickly disappear, and catalyst durability would improve significantly.

III. DIESEL PARTICULATE EMISSIONS

Legislation has also been referred to the Subcommittee to control diesel particulate emissions from motor vehicles. Many of our companies are currently developing and refining trap oxidizer technology which has the capability of reducing up to 90 percent of the diesel particulate emissions from motor vehicles.

In passenger car application, traps are already being equipped on the vehicles sold nationwide by one manufacturer. Today there are over 25,000 trap equipped passenger cars on the road in the United States. As we testified several years ago before the California Air Resources Board, we believe that with adequate lead time to develop and optimize diesel particulate trap oxidizers, a standard in the range of the 0.08 gpm particulate standard contained in S 300 is technologically feasible in light duty application. Indeed, preliminary and unofficial 1987 EPA certification data indicates that those vehicles which are trap oxidizer-equipped achieved emission levels well below 0.1 gpm.

In response to emission standards established by the U.S. Environmental Protection Agency and California, our companies, heavy duty engine manufacturers and other technical experts are working to develop and apply trap oxidizer technology to heavy trucks and buses. Indeed, over 50 companies, several universities and a number of independent technical laboratories are working on trap oxidizer technology world-wide.

Some of the more notable successes in trap oxidizer application to heavy duty vehicles have been in retrofitting these devices on existing urban transit buses. Athens, Greece has had a successful demonstration program underway for two years and is about to equip 15 buses with traps. In the U.S. several transit companies have demonstration programs underway. For example, in Philadelphia a trap-equipped transit bus has operated successfully for over two years.

While engineering challenges still remain in developing trap oxidizers for heavy duty application, the progress to date in developing and optimizing this technology has been encouraging. This progress, however, will only continue if standards remain in effect to provide the regulatory incentive to develop the needed technologies.

Proposals before the Subcommittee to limit the sulfur content of diesel fuel would not only help reduce emissions from diesel-powered vehicles, but would greatly facilitate the development of trap oxidizers. One of the leading candidates for particulate trap regeneration (i.e., oxidizing the particulate trapped by the filter) is utilization of a precious metal catalyst. The most active precious metal catalysts however, will oxidize SO_2 to SO_3, the latter being a particulate. While several of our companies are developing catalyst formations which convert much lower percentages of SO_2 to SO_3, low sulfur fuel will help to minimize sulphate formation in the trap oxidizer system. Low sulfur fuel would allow much greater flexibility in selecting catalyst formulations to be utilized. For example, the prospects of developing and utilizing catalyst formations which could bring about regeneration at lower temperatures (a result of critical importance in heavy duty particulate trap application) would be greatly enhanced if low sulfur fuel is mandated.

Even with systems which do not utilize catalysts for regeneration, low sulfur fuel would facilitate trap oxidizer application. Several motor vehicle manufacturers have reported to EPA that sulfur in the fuel contributes to trap plugging at high mileage. Reducing sulfur levels in diesel fuel would help eliminate any problem with trap plugging.

IV. CONTROLLING EMISSIONS IN USE

Existing emission standards have resulted in significant reductions in emissions in use. Indeed, each time emission standards were tightened, emission levels in use have been reduced.

Nevertheless, as EPA has pointed out, a number of vehicles for a variety of reasons are exceeding one or more of the emission standards for which they were designed to meet. For example, a vehicle with a poor operating engine and inoperative emission controls can emit over 10 times the pollution of a vehicle with a well-maintained engine and a functioning emission control system.

Improving in-use emission control programs would have a direct and major impact on air quality. Such proposals as strengthening existing state operated I/M emission test programs, expanded use of emission control equipment inspection programs, and prohibiting individual car owners from tampering, all would reduce in-use emissions from existing vehicles.

These programs would have a second benefit. To maximize the effectiveness of the advanced control systems designed to meet new, more stringent standards, proper fueling, maintenance and operation of these vehicles by the consumer will be vitally important. Strengthened in-use programs would facilitate compliance with more stringent standards by providing added incentives to vehicle operators to properly fuel, maintain and use their vehicles, thereby better protecting the emission control system.

CONCLUSION

MECA member companies are involved in a part of the development, production, and optimization of complete control systems for motor vehicles. Although we work with other suppliers and vehicle manufacturers on aspects of control systems beyond those we actually produce, we have limited our comments to the areas within our particular expertise.

We fully recognize tighter emission standards will create new engineering challenges to develop and optimize motor vehicle emission control technology. However, our members have extensive experience in emission control technology and these companies would not be currently engaged in research and development of new products capable of greater control, if they did not have the confidence that those challenges can be met. The most effective way to ensure that the control systems necessary to achieve the desired emission reductions will be available is to have fixed standards in place with provision for reasonable lead time. Our member companies are prepared to do everything they can to help ensure that if more stringent standards are set, they will be met.

Testimony of David D. Doniger
Senior Attorney, Natural Resources Defense Council
on behalf of the National Clean Air Coalition
on Motor Vehicle Emission Standards

Senate Committee on Environment and Public Works
Subcommittee on Environment
April 9, 1987

Mr. Chairman and members of the committee, thank you for the opportunity to testify on the hazards to health and environment from motor vehicle emissions. The National Clean Air Coalition supports sharp further reductions in all six major pollutants from motor vehicles and fuels: hydrocarbons, carbon monoxide, nitrogen oxides, particulate matter, sulfur, and lead. Each of these pollutants continues to endanger public health and welfare. Seventeen years after the Clean Air Act was passed, half the U.S. population still lives in areas with dangerous levels of air pollution, and long-distance transport of pollution continues to destroy lakes, forests, crops, buildings, and other man-made materials.

Even though important progress has been made under the existing law, motor vehicles remain one of the largest contributors to ozone and CO nonattainment, to acid rain, and to toxic air pollution. Hydrocarbons from tailpipes, from vehicle refueling, and from fuel evaporation help cause violations of the health-based ambient air quality standard for ozone in most of the nation's large urbanized areas. Up to 45 such areas will not meet the present ozone standard by the December 31, 1987, deadline. Carbon monoxide levels, which are dominated by vehicle emissions, still exceed safe levels in cities that are home to tens of millions of people.

NO_x emissions from vehicles contribute to violations of the current public health standards for nitrogen dioxide and ozone, and to acid deposition hundreds of miles downwind. Diesel particulate emissions, which EPA has projected will steadily rise even under the Agency's standards, are already causing as many as several hundred lung cancer cases and thousands of cases of other respiratory disease each year. Lead in gasoline is still endangering tens of thousands of children, and sulfur in diesel fuel contributes to unhealthy SO_2 levels in urban areas and acid rain downwind.

As if the current situation were not bad enough, EPA will soon have to tighten the ambient standards for four of these pollutants, because the most up-to-date scientific studies show that asthmatics, children, and even healthy adults are harmed at much lower pollution levels than previously documented. The ozone standard needs to be strengthened to address the chronic effects of long-term exposures: Tight one-hour standards are needed for both sulfur dioxide and nitrogen dioxide. And the new particulate standard, focussed on smaller particles, also must be more stringent than the current standard.

It is with this sense of the public health and environmental need that the National Clean Air Coalition reviews the mobile source provisions of S. 300 and S. 321. In the testimony that follows, we are going to praise many provisions of these bills, urge you to strengthen certain provisions, and suggest several additional mobile source-related amendments for your consideration.

Automobiles and Light-Duty Trucks

Let me begin by recalling to your attention that the Coalition strongly supported the strengthened emission standards proposed last year in S. 2203 for the three gaseous pollutants from cars and light trucks, HC, CO, and NO_x. As I said in testimony on that bill, the time has come to reorient auto emission controls to what the best performing cars can do, not the worst performing models. The feasibility of these emission standards is already demonstrated. Using the latest generation of catalyst technology, fuel injection systems, and electronic computer controllers, a number of current engine families -- both big cars and small -- already meet or better these standards. The Coalition continues to believe there is no good reason why in the future the rest of the new car and light truck fleet cannot match these leaders.

The Coalition regrets the fact that the light-duty HC, CO, and NO_x standards of S. 300 and S. 321 are significantly relaxed over those in S. 2203 last year. Certainly, HC standards of 0.25 gpm for cars and 0.5 gpm for light trucks, and NO_x standards of 0.4 gpm for cars and 0.5 gpm for light trucks, will make a major cut in emissions of these health-endangering and acid rain-causing pollutants. The bills would make no improvement in CO emissions, however. The standards, moreover, do not press motor vehicle technology even to the limit of what is possible today, let alone what could be achieved under the constructive pressure of standards that are genuinely technology-forcing. We urge the Committee return to the standards considered last year.

Last year the Coalition also urged the Committee to tighten the particulate matter emission standard for diesel cars and light trucks. We are pleased to see that S. 300 would match the federal particulate standard to California's, 0.08 gpm. The current EPA standard allows 2 times more particulate emissions and is so lax that many diesel cars and light trucks are able to meet it without any tailpipe pollution controls. Trap-oxidizers are now a proven technology and should be required on every vehicle.

The EPA light-duty diesel standards contain a further loophole under which manufacturers may average particulate emissions from different diesel engine families; the result is that some can emit even more than the nominal standard. The Committee should add a provision to eliminate the averaging loophole.

The Coalition strongly supports the extension of the official "useful life" for light-duty vehicles to 10 years or 100,000 miles, as proposed in both S. 300 and S. 321. As I said last year, pretending that cars operate for only five years or 50,000 miles, the current useful life, is like pretending people live only 35 years.

Heavy-Duty Engines and Vehicles

The Coalition applauds the provisions of both bills for heavy-duty engines and vehicles. They would remedy EPA's complete failure to carry out the existing law's command to set truck and bus standards based on the capabilities of the "technological leader." Engines requiring more time to meet these levels are able to stay on the market under nonconformance penalties that provide a financial incentive for rapid compliance. EPA, however, totally ignored this directive for leader-based standards and expressly based its truck and bus standards on the technological laggards.

The EPA standards survived judicial review in the U.S. Court of Appeals in Washington in November 1986, but only barely. The court was able to sustain the standards only by applying a standard of review that even by today's judicial standards struck most observers as startlingly and excessively deferential, holding that Congress had not legislated the technological leader approach with "laser-like clarity."

S. 300 and S. 321 would largely rectify EPA's failure to carry out the existing law. Both bills reduce heavy-duty NO_x emissions to 4.0 g/BHP-hr in 1991 and 1.7 g/BHP-hr in 1995. S. 300 would also take particulate matter emissions down to 0.1 g/BHP-hr for diesel buses in 1991 and for diesel trucks in 1992. Even these numbers do not press the limits of the envelope. EPA's own analysis of capabilities for the early and mid-1990s shows that the leading truck and bus engines can meet even more protective standards. Gasoline engines could have met the 1.7 g/BHP-hr NO_x standard already had they not been exempted from the use of three-way catalysts by EPA. Leading diesel engine makers have the means to better 0.10 g/BHP-hr for particulate matter, along with a NO_x standard as low 3.0 grams. A standard of 1.7

g/BHP-hr is achievable by diesels by conversion to alternative fuels, such as methanol (which also delivers very low particulate emissions). We believe it can also be achieved, given the regulatory incentives provided by firm standards, by further advancing engine and trap-oxidizer designs.

In addition to adopting the proposed standards, we urge you to reverse the Court of Appeals' misreading of the intent of the existing law by restoring the general mandate for EPA to set "technological leader" standards when the Agency acts for other years or other pollutants.

Other Requirements

The Coalition also supports other important provisions bills such as the removal of lead from gasoline, as proposed in S. 300, and the removal of sulfur from diesel fuel, as proposed in both bills. Scientific studies show that lead impairs the health of children at even lower levels than previously believed. There is just no excuse for continuing to expose children to any lead from auto exhaust. Sulfur in diesel fuel contributes to ambient SO_2 and particulate levels dangerous to health and to acid rain downwind. EPA studies show that removing sulfur from diesel fuel would save each truck owner hundred of dollars per year -- totally disregarding health and environmental benefits -- in maintenance expenses now devoted to combatting corrosion and wear.

The Coalition supports the bills' establishment of auto inspection and maintenance programs for NO_x. Likewise, we support the requirement of S. 300 for a 90% pass rate in assembly line testing.

We want to stress our support for S. 300's provisions for controlling fuel vapors emitted when filling up at gas stations and from evaporation from engines. These fuel vapors are one of the largest uncontrolled contributors to the ozone smog problem; they also contain known and suspected carcinogens. The bill's provisions for use of vapor recovery equipment ("Stage II" controls) on gas pumps, "on-board" carbon canisters on vehicles, and a rollback of fuel volatility to historical levels are inexpensive and are necessary to fight both smog and cancer.

Additional Amendments

The National Clean Air Coalition urges you to support several additional mobile source amendments to the existing Clean Air Act. The law should be amended to close loopholes in many EPA-approved inspection and maintenance programs. The worst example is EPA approval of an I/M program in Houston, Texas, that amounts to nothing more than a look under the hood. EPA has identified numerous improvements that should be made in other areas' programs in order to get the full benefit of the program. The Agency has thus far failed to required these improvements, however. The law should be amended to accomplish what EPA thus far has failed to do.

We also urge you to adopt a major improvement in the EPA in-use inspection and recall program. The prospect of recalls for vehicles that do not meet standards throughout their useful lives is the single most important incentive for manufacturers to design and build durable emission control systems. At the present time, however, there is no connection between data on poorly performing cars generated by state I/M programs and the EPA recall program. A state's data may show that an auto model or an engine family is consistently failing to meet standards. Yet no recall is required unless and until EPA tests that model or family and laboriously moves through the steps needed to trigger a recall. We suggest that the Committee adopt a provision allowing states, as well as EPA, to trigger recalls based on test data generated from their I/M programs.

Mr. Chairman, members of the Committee, these motor vehicle and fuel controls, coupled with further reductions from stationary sources, are absolutely necessary to protect public health and the environment. The promise to protect the health and welfare of the American people, made in the Clean Air Act 17 years ago, has yet to be fulfilled. These bills are a strong start towards fulfilling the promise. The National Clean Air Coalition looks forward to working with you pass the recommended mobile source controls along with comprehensive legislation on the whole Clean Air Act.

STATEMENT OF JAMES D. BOYD
EXECUTIVE OFFICER, CALIFORNIA AIR RESOURCES BOARD

before the

SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

April 9,1987

Senator Mitchell, members of the committee. Thank you for the opportunity to address the role motor vehicles can play in reducing air pollution.

Since the early 1960s, the Air Resources Board has been actively involved in developing and implementing methods of reducing emissions from motor vehicles, as well as other sources of pollution. Over the years we have led the nation in establishing technology forcing standards for motor vehicles that have resulted in the development of the catalytic converter, on-board computer controls, and the diesel particulate trap. We have also pioneered the use of low volatility gasoline and vapor recovery controls for vehicle refueling.

Our program has been very effective. Smog forming hydrocarbon (HC) and oxides of nitrogen (NOx) emissions from motor vehicles in the Los Angeles basin, have been reduced by over 40 percent over the past 15 years, despite a 50% increase in vehicle use. Because of this control, atmospheric ozone has been reduced. The reductions have been most dramatic in the past 7 years, which is the period in which both HC and NOx emissions were reduced. This real world experience has led us to conclude that for areas such as Los Angeles, reduction of both HC and NOx emissions are needed to effect improvements in ozone.

We have also seen a greater than 50% reduction in ambient carbon monoxide (CO) over the past 15 years, and this is soley attributed to reduction in vehicle emissions.

Senator Mitchell's invitation asked me to address California's recent experience with vehicle and fuel emission control programs.

We are making a major effort to reduce emissions from in-use vehicles. Currently most vehicles suffer from emissions above the design standard for the vehicle. These "excess" emissions are caused by poorly designed or constructed emission control devices, and by poor maintenance and tampering. To address design problems, we have expanded our in-use recall testing. We believe that once manufacturers realize that the standards will be enforced, that additional efforts will be spent to make more durable systems.

We rely on the vehicle inspection and maintenance program to reduce tampering and improve maintenance by vehicle owners. We have recently completed an in-depth review of our I/M program, which is now three years old. Our program features stringent emission standards, a comprehensive tampering inspection, and computerized testing. In design, it is one of the best in the country.

Our evaluation showed the program was reducing vehicle emissions of HC and CO by about 11%. This makes it one of the most effective emission control programs we have, in terms of tons of pollution reduced. We also found, however, a number of problems, which if remedied, would double the emission benefits.

First, more enforcement is needed to assure that inspections, in particular the subjective inspection for tampering, are performed properly. Our mechanics know how to do detect tampering, but most don't apply the effort. Second, many mechanics are not equipped to repair the 1980 and newer model cars. Much more training, and greater use of computerized diagnostic tools, are required. Third, the limit on repair cost, which many programs set at $50 to $100, must be at least $200 for the 1980 and newer cars. For parts which cost more to replace, the emission warranty should be extended to 100,000 miles.

As I indicated, California has led the way in establishing stringent emission standards for new vehicles. We continually review the development of technolgy, and increase the effectiveness of our standards when feasible. The Board recently adopted a 0.4 gram per mile (gpm) NOx exhaust emission standard for passenger cars and light trucks, effective in 1989. We did this because it was clear the technology would be available, and we were convinced that lower NOx emissions would benefit ozone, reduce fine and acid particulates, and improve visibility.

We have also completed a technical evaluation of a 0.25 gpm HC exhaust standard for light duty vehicles. Our conclusion is that such a standard is feasible and cost effective, and will have no adverse impact on fuel economy or performance. We anticipate that our Board will consider it next year.

We are also evaluating more stringent emission standards for gasoline powered trucks. These standards would be based upon the application of proven passenger car emission control technology.

Nearly half of the particulate emissions from heavy duty trucks come from out-of-state trucks operating in California, thus this is one area where we must rely on the Congress and the EPA. In 1985 we commented to EPA that a 4.0 gram standard for NOx was feasible by the early 1990s, however, EPA adopted a less stringent 5.0 gram standard. Since that time, control technology has advanced substantially, and the difficulty of reducing NOx has been lessened. By the year 2000 diesels will account for 13% of all NOx emissions in California. Thus a standard which reflects the best possible control is necessary to continue combating NOx related air quality problems.

The 0.1 gram heavy duty diesel particulate standard is forcing the development of particulate traps. Mercedes Benz diesel cars have been using particulate traps since 1985, and prototype traps are being used on buses throughout the world. Thus we believe this standard can be met provided it is clear that the standard will not be relaxed.

Even with implementation of the controls discussed above, California will face worstening air pollution around the turn of the century. This will occur because we are reaching the limit of our ability to further control gasoline and diesel engine emissions, while the number of vehicles continues to increase. In order to continue to improve air quality in the next century, we are exploring innovative means of reducing vehicle emissions.

One promising approach is the use of methanol to fuel passenger cars and light trucks. Studies by the state and ARCO have shown that methanol powered vehicles produce less than one half the ozone of gasoline fueled vehicles. The use of methanol does not depend on the development of new technologies. The changes in the gasoline engine necessary to let it operate on methanol are relatively minor. We have 600 methanol powered cars in operation today. Several have accumulated over 100,000 miles. Ford has also developed a vehicle which can operate on any combination of methanol and gasoline. This type of vehicle will facilitate the introduction of methanol vehicles until methanol is widely available. A bill has been introduced into the California legislature to require manufacturers to offer methanol vehicles for sale beginning in the early 1990s.

Methanol can also be used in diesel bus and truck engines, but the design changes are somewhat more extensive. The 1991 emission standards for new buses have elevated interest in methanol buses. Two methanol buses have been operating outside of San Francisco for several years and 33 more have been ordered for use in Los Angeles. It is likely that manufacturers will offer methanol buses as the preferred way of meeting the 1991 EPA bus emission standards.

It would take several decades to complete a transition to methanol. However there are other fuel modifications which will lower emissions can be made now. These modifications are particularly effective because the cleaner fuel can be used immediately by the entire vehicle fleet.

One of the most effective changes is to limit fuel volatility. Low volatility gasoline has been required during the smog season since the early 1970's. Hydrocarbon emissions have been reduced by 75 tons per day, a six percent reduction in the Los Angeles basin. The cost is one cent per gallon. Combined with refueling emission control at service stations, the total reduction in HC emissions is 280 tons per day, approximately 20% of the entire inventory for the Los Angeles basin.

Another fuel control we have adopted is low sulfur diesel fuel. By removing most of the sulfur from diesl fuel, the amount of particulate matter in the atmosphere is reduced. In addition to benefitting public health, visibility is improved and particulate traps used on diesel truck engines will have a longer life. The cost is about 5 cents per gallon.

This concludes my oral remarks. I am submitting additional written information for the record. Thank for the opportunity to address the committee, and I would be pleased to answer any questions.

SUPPLEMENTAL INFORMATION

SUBMITTED BY JAMES D. BOYD, EXECUTIVE OFFICER
CALIFORNIA AIR RESOURCES BOARD

TO

SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

April 9, 1987

Feasibility of More Stringent Standards

California's experience shows that manufacturers can meet tighter emission standards than currently required for every class of vehicle. This can only be done, however, if manufacturers are provided with clear, firm emission reduction goals and sufficient lead time to develop and apply needed emission control technology.

More stringent HC and CO standards can be met by light-duty vehicles through the use of methods which reduce the emissions during cold engine operation. The technologies necessary are discussed in an ARB staff report on the feasibility of a 0.25 gpm HC emission standard for 1992 light-duty vehicles, a copy of which is attached as Appendix 1. Last year ARB adopted a regulation to require compliance with a 0.4 gpm NOx emission standard for some 1989 and most 1990 and subsequent models, after finding that improved catalysts and use of fuel injection were sufficient to achieve this standard.

Similar HC, CO and NOx standards are achievable by light-duty trucks and probably by heavy duty gasoline trucks up to 14,000 pounds gross vehicle weight, provided manufacturers successfully develop more durable 3-way catalysts for the heaviest applications. Catalyst technology for motorcycles has been demonstrated and will allow compliance with an HC standard more stringent than 1.0 gram per kilometer.

Further control of heavy-duty diesel trucks requires the development of particulate traps, changes in the composition of diesel fuel, or the use of methanol, as is discussed later. The effectiveness of particulate traps has been demonstrated on passenger cars (all 3.0 liter Mercedes Benz diesel cars use traps) and on buses and mine equipment. Less work has been done on traps for heavy-duty trucks as it appears manufacturers are directing resources towards meeting the EPA interim 1991 particulate standard without use of traps on most engines. Unless more development work is done on trap technology, this could precipitate a request for a delay of the 1994 particulate standard, since the 1994 standard will undoubtedly require near universal use of traps. We believe that traps can be successfully developed and used on heavy-duty diesel trucks by the early 1990s, however this will occur only if engine manufacturers perceive that the current standards will not be relaxed or delayed.

Changes to the composition of diesel fuel would also be beneficial. Removal of most of the sulfur from diesel fuel will reduce the formation in the atmosphere of sulfates, which are fine particles that contribute to exceedances of the national

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Note: The appendices attached to this statement have been retained in committee files.

ambient air quality standard for particulate matter. The sulfur in the fuel also makes it more difficult to develop efficient particulate traps for diesels. In addition, the aromatic content of diesel fuel can be reduced. Less carbonaceous particulate matter (soot) is emitted when low aromatic diesel fuel is used.

This is a particularly attractive control technique since the use of low aromatic fuel would reduce emissions from the current fleet of diesels, whereas trap technology, at its current stage of development, is generally applicable only to new diesels. (Retrofit of diesel buses with traps may be feasible, however).

Unless there is a technological breakthrough, a NOx standard significantly more stringent than 4.0 grams per brake-horsepower-hour (the EPA 1991 NOx standard is 5.0) is likely to be achievable by heavy-duty diesels only with the use of methanol.

A reasonable alternative that manufacturers could use to meet much more stringent standards is to develop vehicles which can burn cleaner fuels. The most promising fuel is methanol.

Current technology gasoline engines can be designed, with only minor modifications, to burn methanol. When burned in this type of engine, the exhaust and evaporative emissions have a much lower potential to form atmospheric ozone. Thus methanol-fueled vehicles will cause even less air pollution than gasoline-powered vehicles that meet stringent emission standards.

Methanol can also be used in diesel-type engines, although much greater redesign is required. Its advantage as a substitute for diesel fuel is that particulate (soot) emissions are virtually eliminated, and NOx emissions can be 50 percent lower than the lowest NOx emission rates currently possible from diesel-fueled vehicles.

Finally, methanol can be produced from the world's abundant supplies of natural gas and coal. A report by a California task force assembled to study and promote methanol use in California provides additional information and can be found in Appendix 2. Also included in Appendix 3 is a report on California's experience operating a fleet of 600 methanol cars and two methanol buses.

Gaseous fuels such as methane (natural gas) and butane are good motor fuels, but they have several disadvantages when compared to methanol. One disadvantage is that they produce higher NOx emissions. Another is that very high pressure fuel tanks are needed to give a methane or butane-powered vehicle sufficient driving range. The parasitic weight of the fuel tank itself lowers fuel economy, and the system is much more expensive overall than methanol systems.

One technology that holds great promise, but cannot currently be described as available technology, is electric vehicles. Electric vehicle technology is not yet at a stage where it is competitive with conventional vehicles, but some progress is being made. The biggest advantage of electric vehicles would be that they have no exhaust emissions. The emissions are produced at an electric utility power plant and are lower on a per vehicle basis, and easier to control. Furthermore, electric vehicles could use power from a utility located outside a nonattainment area which would help the area to meet the ambient air quality standards. An ARB report on the progress and potential of electric vehicles is given in Appendix 4.

The Use of Methanol to Reduce Emissions

The use of cleaner fuels such as methanol will play an important and essential role in our attempt to meet the federal clean air standards. We are currently evaluating how a state could best facilitate a transition from gasoline and diesel fuel to methanol, and we are certain that a transition would be made easier if there was support from the federal government.

California has not yet committed to pursue a transition to methanol, and thus we do not have a specific plan we can share with you. We are actively discussing the many issues that such a transition would raise with interested parties in government and industry. Some background will help put the discussion of a transition to methanol into perspective.

Methanol engine and vehicle technology for light-duty vehicle applications is well developed and has been demonstrated in commercial and government fleet operations. Thus technology development is not a major barrier to introduction of methanol into the light-duty fleet.

There are, however, other obstacles to the commercialization of methanol vehicles and fuel. The major obstacle is getting the introduction started. This has commonly been referred to as the "chicken and egg problem" Automobile manufacturers will not produce methanol-powered cars unless there is methanol fuel available at fueling stations, however there will be no fuel available unless methanol cars are produced. Most parties interested in methanol agree that government will have to be involved in helping solve this dilemma.

Once the introduction begins, fuel demand and supply should grow together. This implies that during the period in which there are relatively few methanol cars in operation, fuel will be available at only a limited number of stations. In addition, if the introduction begins in only one area, such as California, fuel will likely not be available in other states where Californians may wish to drive. Thus during the introduction and transition to a methanol-based fuel system, it seems essential that methanol vehicles also be able to operate on gasoline when methanol is not available. Fortunately, engine technology has been developed by Ford Motor Company and other major manufacturers which allows methanol vehicles to operate on any combination of methanol and gasoline. This car, called the flexible fuel vehicle, or FFV, allows the operator to fuel with whichever fuel is available. The availability of the FFV technology will help simplify the introduction of methanol vehicles.

The California Energy Commission indicates there is sufficient methanol available on the world market to support the introduction of methanol vehicles. Current excess capacity is at least one billion gallons per year, enough to operate one million cars. Additional capacity is coming on line, and projections suggest that 40 to 50 million gallons of methanol per year could be produced at relatively low price from remote flare natural gas. This supply is sufficient to meet the demands of 40 million cars, which is more than twice the current vehicle population in California. Beyond that, methanol can be produced from our huge domestic coal reserves, although at a higher price. Thus methanol will be available if the demand for the fuel is established.

To solve the chicken and egg dilemma, it seems inevitable that an incentive to produce methanol vehicles will be necessary. One candidate incentive is monetary credits for the production and purchase of vehicles. Another approach is a mandate to manufacturers to produce methanol-compatible vehicles.

A form of monetary credit for production was suggested by legislation sponsored last year by Senator Danforth. His approach gave extra CAFE credit to methanol-compatible vehicles. It would establish a fuel economy value for vehicles capable of operating on methanol that was based only on the 15 percent gasoline used as an additive in most methanol fuel. (Gasoline is added to methanol to assist starting and to provide a visible flame should the fuel be ignited.) A methanol car would be typically rated at over 100 mpg for purposes of CAFE. Since Ford, General Motors and several other manufacturers are reportedly facing fines in the hundreds of millions of dollars if the 27.5 mpg CAFE standard is enforced, the Danforth approach provides a strong incentive to produce methanol-compatible vehicles. Fines could be avoided and the manufacturer could retain the flexibility to continue to produce highly profitable large cars. Senator Rockefeller has introduced similar legislation this year.

Danforth's bill was opposed by groups that were concerned that the methanol-compatible vehicles (FFVs) produced would rarely use methanol fuel, while the automobile manufacturers would reap a large monetary credit for each vehicle regardless of whether it actually used methanol fuel. In this situation gasoline use and emissions would also be higher than if compliance occurred with no methanol credit. If Danforth's approach could be modified to tie the manufacturer CAFE credit to the amount of methanol actually used, a strong, environmentally sound incentive would be created to both produce methanol-compatible vehicles and encourage the use of methanol fuel.

A rationale for a mandate to produce methanol-compatible vehicles is their lower ozone-forming potential. A bill has been introduced into the California Legislature which would establish such a mandate (AB 234, Leonard). A mandate can also be supported on other grounds. A paper recently published by staff of the Department of Energy (Appendix 5) provides an interesting description of the energy security benefits of mandated methanol vehicle production.

One risk of basing the transition on FFV vehicle technology is little methanol fuel may be used unless its price is favorable compared to gasoline. This risk is highest during the early stages of introduction, and thus has caused some parties to suggest fuel use incentives are necessary.

The price of methanol fuel at ports of entry has in recent years tracked the price of gasoline. However, the transportation and storage infrastructure for methanol has not been established due to the current lack of demand for methanol fuel. Thus in the early years of introduction, low volume sales of methanol will result in a higher distribution cost compared to gasoline. Thus it is likely that methanol fuel will initially be slightly more expensive than regular unleaded gasoline, although competitive with premium. (Methanol is a premium fuel, with octane of 110.) There will also likely be some consumer confusion regarding which fuel to purchase, since the price of methanol per gallon is much less than gasoline, but more gallons are needed to travel a given distance. Some have suggested that both of these barriers could be overcome by a temporary fuel tax credit to encourage the use of methanol. Given the generous federal tax credit for ethanol fuel, a similar credit for methanol has a precedent. Unlike ethanol, however, the credit could be dropped once demand caused sufficient volume to create an efficient distribution network. A methanol fuel tax credit could also be structured to be revenue neutral by increasing the tax on gasoline. The increase would only be a fraction of a penny.

It is possible that several of the incentives described above would need to be used in concert to stimulate the introduction and transition to methanol. For example, one transition scenario under consideration involves a requirement that automobile manufacturers produce a specified number of methanol-compatible flexible-fuel vehicles. (A CAFE credit would support this requirement by serving to offset the higher cost of producing vehicles.) Fleet operators would be required to offer methanol. To support this requirement it would be necessary to ensure that current underground gasoline tank replacements be methanol compatible. The likelihood that non-fleet purchasers of methanol-compatible vehicles use methanol would be increased if a temporary fuel credit, as discussed above, was established. In addition, the development and purchase of advanced technology methanol vehicles which have superior fuel economy and even lower impact on ozone formation could be required or encouraged. These vehicles would operate primarily on methanol. Under such a scenario, it is possible to have over 1 million methanol vehicles in operation in California by the turn of the century. By 2101, the majority of the light-duty fleet could be operating on methanol. Each methanol vehicle which operates on methanol would have 50 to 90 percent less ozone formation potential than a comparable gasoline-fueled vehicle.

Methanol also has the potential to reduce heavy-duty diesel particulate and NOx emissions. The 1991 particulate emission standard for new buses is expected to result in the sale of methanol-fueled buses. The engine technology development necessary to make a diesel-type engine run on methanol has already been accomplished as part of California's methanol development activities. Only a few diesel engine models are used in buses, however. Thus an important role the federal government could play is to assist manufacturers of other diesel engines to develop methanol versions. The Methanol Task Force report (Appendix 2) identifies prototype development as the next step necessary to facilitate the conversion of the heavy-duty truck market to methanol. California has committed $700,000 to this effort, however additional resources are needed to support cost-shared development of the many different types of heavy-duty engines.

Impact of Federal Vehicles in California

We estimate that one fourth of the more than 19 million vehicles operating in California were certified to federal emission standards when new.

California residents are prohibited from purchasing a new federally-certified vehicle. "New" is defined as a vehicle with less than 7500 miles on the odometer. California residents may purchase used federal vehicles. Used vehicles enter

California with non-residents who move to our state, by importation by car dealers, auctioneers, etc., or by out-of-state purchase by residents. The migration to California of federal vehicles amounts to approximately 250,000 privately owned light-duty vehicles, 50,000 commercial vehicles, and 12,000 motorcycles per year. In addition there is a substantial amount of transient vehicle mileage driven in California by a great number of tourists who visit here each year, and by heavy-duty vehicles (mainly line-haul trucks) engaged in interstate commerce.

Table 1 presents the number of motor vehicles in California by source category and origin for 1985. Vehicles not originally sold and registered in California were assumed to be certified to federal standards; the small number of vehicles imported by foreign diplomats, and the somewhat larger number of vehicles imported through the grey market, are not included in these statistics. As can be seen from the data in the table, roughly one-quarter of the light-duty vehicles and almost one-half of the heavy-duty diesel vehicles currently operating on California's highways are certified to federal standards.

Another indicator used to assess the emissions impact of motor vehicles is vehicle miles traveled (VMT). Table 2 presents a statewide estimate of VMT in 1985 by vehicle type. In the aggregate, about 27 percent of the mileage driven in California can be attributed to federal vehicles. Federal heavy-duty diesel vehicles contribute roughly 55 percent of the total heavy-duty diesel VMT in California. These vehicles travel more miles per day and have higher emission rates than light-duty vehicles, therefore, the net effect is that heavy-duty diesels contribute disproportionately more emissions than would be expected from looking solely at the vehicle population.

Improvements to Vehicle Inspection and Maintenance Programs

The ARB and local air pollution control districts have just completed an extensive evaluation of the first two years of operation of the California I/M program. Our program is decentralized, utilizes state-of-the-art computerized emission test equipment, includes a tampering and exhaust inspection, and is subject to a $50 cost limit for repairs not associated with tampering.

Our evaluation has lead us to conclude the following. First, I/M reduces emissions. Our program has reduced HC emissions of inspected vehicles by 12 percent, CO emissions by 10 percent, and NOx emissions by 4 percent. Equivalent reductions in tons per day for the Los Angeles Basin are 53 tpd HC, 457 tpd CO and 10 tpd NOx. These reductions are very large compared to most other control measures available to further reduce emissions.

Second, significantly greater emission reductions can be achieved through improvements to the program. The needed improvements include expanded enforcement, reduction of the number of cars receiving waivers of full repairs, and substantial upgrading of the skills of mechanics, especially as it relates to the repair of 1981 and newer computer-controlled cars. If improvements are made in each of these areas, we believe the I/M program will reduce emissions of the inspected fleet by at least 27 percent HC, 16 percent CO, and 11 percent NOx.

To achieve this improvement in emission reductions will require a strong commitment of the implementing agency. For example, mechanics will have to perform the visual tampering check accurately 70 percent of the time (in California it is currently done correctly 25 percent of the time). Substantial oversight and enforcement will be required to achieve this high rate of proper tampering checks. More effective repairs will also be required, and this can be achieved in part by raising the repair cost limit to at least $150 for older catalyst-equipped cars, and $200 for newer cars. The emission warranty needs to be extended to 100,000 miles for parts whose replacement exceeds the repair cost limit. In addition, cars under warranty must be denied any repair cost waiver. Finally, a major effort to improve the ability of mechanics to repair 1981 and newer models is needed.

The improvements discussed above can be achieved without extensive modifications to the structure of most centralized and decentralized idle test programs. Further improvements in the effectiveness of repairs could be achieved through the use of improved diagnostic equipment and/or dynamometer testing, and the elimination of repair waivers. (An alternative to no repair cost limit is to extend the emission warranty on major emission control parts to 100,000 miles). If properly implemented, programs without repair cost limits that utilize this type of equipment could achieve up to a 37 percent reduction in HC emissions. Reductions for CO and NOx would be 23 and 20 percent respectively.

The emission reductions discussed above apply to a program with biennial inspection frequency. Annual inspection frequency would increase the reductions achieved, however the degree of improvement depends on how effective the biennial program is. For example, we estimate that a very effective biennial program, such as the one discussed in the previous paragraph, could achieve an additional 2 percentage point reduction in emissions of each pollutant if the inspection frequency was increased to annual. The additional reductions occur because emission control defects are detected and corrected more quickly with annual inspections. However, if one assumes that the I/M program fails to identify and correct many emission defects (as is probably the case with most current programs), then the benefits of an annual inspection frequency would be greater simply because there are more chances to identify and correct previously undetected emission problems.

In summary, we believe there is considerable room for improvement to California's I/M program, and we expect this is true of most other programs in the country. An improved and more effective I/M program would feature strong oversight and enforcement by the implementing agency, a repair cost limit of no less than $200 for 1981 and newer cars, a federal 100,000 mile warranty on major emission control devices, an effective inspection for tampering, an exhaust test that utilizes the latest computerized exhaust test analyzer, and a cadre of mechanics with skills upgraded sufficiently to diagnose and repair more of the defects common to newer technology vehicles.

Comments on the Impact of NOx Emissions on Ozone Air Pollution

California, at the state and local level, is in the process of reevaluating and updating our control strategies for ozone and carbon monoxide. Our efforts have been hampered somewhat by EPA's inability to provide guidance on how to best comply with the Clean Air Act in the eight or more urban areas not expected to attain by the current deadline. Nevertheless, in the interest of public health and consistent with the intent of the Act, we are proceeding without EPA guidance toward attainment as expeditiously as practicable. While we do not have a complete strategy for each urban area in California at this time, we have arrived at some preliminary conclusions. These conclusions are based on our experience in analyzing and attacking the nation's most severe and pervasive ozone problem. The most important of these conclusions are:

1. Secondary pollutant problems, of which ozone is the most important in California, have been less responsive to emissions control than problems caused by primary pollutants. Steady and often dramatic reductions in ambient levels of primary pollutants such as sulfur dioxide, carbon monoxide and lead have occurred in rough proportion to reductions in emissions. Ozone reductions are generally less than, and not proportional to, reductions in precursor emissions.

The best example of this situation occurred in Kern County. The area's 1979 SIP contained extensive control of reactive organic gas (ROG) emissions from oil production activities, and projected attainment of the ozone standard by the end of 1982. Design values for ozone in Kern County were approximately 0.17 ppm, and the County instituted controls that reduced ROG emissions by about half. The ROG control strategy was somewhat successful in reducing the number of days and hours on which the standard was exceeded, but resulted in very small improvement of the peak level, the key indicator used by EPA to assess progress. The response of the second highest day's ozone levels to these reductions was quite small, with ozone levels of 0.15 and 0.16 ppm occurring in 1983 and 1984 respectively.

2. Meteorological variation is an important confounding factor in the design of control strategies. First, the frequency of adverse meteorological conditions determine the number of high ozone days in a given year and there is substantial variation from year to year. Second, most urban areas experience high ozone during several different types of meteorological regimes. The effectiveness of an ozone strategy can vary significantly from one adverse meteorological regime to another.

   There are numerous examples of these factors in California. For example in 1983 the San Francisco Bay Area experienced a peak ozone level of 0.20 ppm and exceeded the standard on 21 days. Less severe meteorology in the prior two years had produced only 8 (1981) and 5 (1982) days which exceeded the standard, and peak values of 0.18 and 0.15 ppm respectively. Santa Barbara provides an example of the complications connected with widely different meteorological regimes. Controls for this relatively clean area must be analyzed for at three regimes: stagnant days where the county's own emissions are most important, days with westerly winds on which emissions from OCS oil operations are important and days on which easterly winds transport pollution from the Los Angeles basin.

3. Transport of ozone and its precursors over great distances can create high background pollutant loading that limits the effectiveness of locally applied strategies. In some areas, peak ozone concentrations are entirely attributable to transport. Such a case is

illustrated by the 1982 SIP for the San Diego Air Basin. This plan demonstrates that the days with the highest ozone values are attributable to transport of pollutants from the Los Angeles basin, approximately 100 miles to the north. The San Diego plan, which was approved by the EPA, specifically excludes these days from its control strategy, and instead concentrates on the control needed to achieve the standard on days on which transport is not the overwhelming problem.

4. While sophisticated models can in theory handle the combined influences of the factors described above, the use of such models is heavily constrained. A large, sophisticated and extremely expensive data base is needed in each area. Several years are needed to design and execute an airshed modeling study for ozone. The results of a good study can be used qualitatively to pave the road to an effective control strategy. Their inherent imprecision, however, means they cannot be used to accurately predict the maximum ozone concentration that will occur at any given level of precursor emissions. In fact, no tool exists to reliably predict the emissions reductions needed for attainment of the ozone standard. Reasonable estimates are the best that can be done with scientific validity.

5. EPA's strategy of concentrating on reduction of ROG has not worked well in many areas. The role of nitrogen oxides in urban ozone formation is complex, controversial and extremely important. We have found areas in which controlling both hydrocarbons and nitrogen oxide emissions has been more effective at reducing ozone than the standard EPA approach of reducing hydrocarbons alone. Our experiences in the Los Angeles basin illustrate this problem. Figure 1 presents estimates of the emission trends for NOx and ROG over the past twenty years. If reductions in ROG emissions are assumed to be the key to improvement in ozone, then steady and substantial progress should have been made during this period. However, ozone trends did not closely correspond to the trend in ROG emissions.

   Analysis of emissions trends reveals that three distinct control phases were pursued during this 20 year period. Between 1966 and 1973 ROG emissions were substantially reduced while NOx emissions increased. Between 1973 and 1979 ROG emissions were reduced while NOx emissions remained constant. Finally between 1979 and 1985 both ROG and NOx emissions were substantially

> reduced. In the period when the "ROG Only" strategy was applied (1973-79), ozone in a widespread area of the basin, that portion with the worst air quality, changed very little. In contrast, between 1979 and 1985, when a combined "ROG and NOx" strategy was applied, substantial and sustained improvements in ozone were observed. The conclusion of this analysis was that ROG control, in the absence of NOx reductions, was ineffective in reducing ozone in the downwind, most polluted portion of the SCAB, and had questionable effects in the central portion.

In response to all of the uncertainties and problems mentioned above, some have suggested that we delay control actions until better quantification is possible. However, we would recommend an alternative approach, one that would involve implementation of reasonable control measures in advance of precise quantification (which may be several years coming), once it becomes clear that an area will not attain standards in the near future with currently adopted measures.

In most urban areas of California additional controls will be needed both to reduce emissions below current levels and to offset the effects of population and economic growth. Although it is impossible to accurately identify the exact reductions needed for each area or to pinpoint the sources that can be controlled, some general statements are possible.

First, we expect that many areas will be like the SCAB and that a strategy which combines control of both ROG and NOx will be needed. Second, motor vehicle controls, in the form of more stringent standards and greater in-use durability, will continue to be a major source of the needed emission reductions. It also seems likely that improvements to California's I&M program will provide significant emissions reductions and that in the long term much could be gained from the widespread use of methanol as a motor vehicle fuel.

In terms of measures to control stationary sources, new emission reductions are harder to identify. Most emissions of ozone precursors in California from larger sources are already well controlled, and such sources represent a small percentage of total emissions of ROG (12%) and NOx (14%). Emissions from categories of individually small sources that are collectively significant (such as architectural coatings) are already subject to known feasible controls and will be difficult to reduce significantly. Perhaps the most promising area where emission reductions might be gained is stronger enforcement of existing regulations. The ARB is currently working with local air pollution control districts in California to develop this idea further. Additionally, we currently are benefiting from widespread use of natural gas and are dependent on continuation of the current situation with respect to this relatively clean fuel.

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We do see a continued need for consideration of the air quality impact of indirect sources, and for the use of transportation control measures. Our current projections of emissions for each of the state's nonattainment areas indicate that economic and population growth will, in the late 1990's or early 2000's, result in a turn around of the steady decreases in emissions that have been achieved since the early 1970's. The growth in people and vehicle use is a direct consequence of an improved economy and keeping California an attractive place to live. It is difficult to imagine a future in which this growth does not occur. However transportation control measures (such as increased ridesharing, or better planned communities) can help to mitigate a portion of emissions that result from growth.

The Effects of RVP and Stage II on HC Emissions

Attached are several charts which describe the costs and benefits of 9 psi RVP gasoline and Stage II vapor recovery.

- REGULATIONS ADOPTED BY THE ARB LIMIT RVP TO 9 POUNDS PER SQUARE INCH IN GASOLINE MARKETED DURING THE MAIN SMOG SEASON

- THE SMOG SEASON IS DEFINED AS:

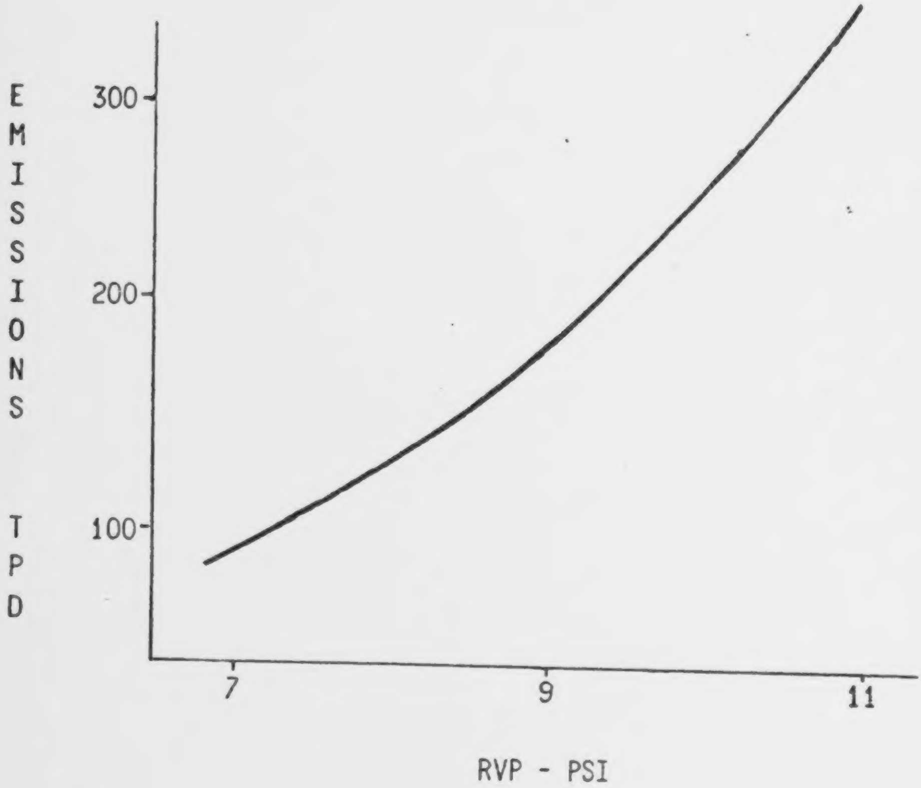
    - APRIL THROUGH OCTOBER IN LOS ANGELES VICINITY AND ADJACENT DESERT AREAS

    - MAY THROUGH SEPTEMBER IN SAN DIEGO, SAN FRANCISCO BAY AND MOUNTAIN AREAS AND THE CENTRAL VALLEY

    - JUNE THROUGH OCTOBER IN THE CENTRAL COAST

    - JUNE THROUGH SEPTEMBER IN THE NORTH COAST AND LAKE COUNTY AREAS

EVAPORATIVE ROG EMISSIONS FROM
GASOLINE AS A FUNCTION OF RVP
LOS ANGELES BASIN - 1984



REDUCTIONS IN ROG EMISSIONS IN THE LOS ANGELES BASIN FROM GASOLINE EVAPORATIONS
(TONS PER DAY IN 1982)

CONTROL	EMISSION REDUCTIONS
o VAPOR RECOVERY*	
- STAGE I**	140 TPD
- STAGE II**	65 TPD
o EVAP. CONTROLS ON MOTOR VEHICLES*	360 TPD
o 9.0 RVP LIMITATION***	75 TPD
o REMAINING EMISSIONS	180 TPD

* REDUCTIONS WITH 9.0 PSI RVP GASOLINE

** ASSUMES 95% EFFECTIVENESS

*** ASSUMES RVP OF 10 PSI IF NO LIMIT

PERCENT REDUCTIONS IN ROG EMISSIONS FROM SOURCES OF GASOLINE EVAPORATION WITH IMPLEMENTATION OF 9.0 RVP LIMIT

SOURCE CATEGORY	PERCENT REDUCTION BY BASE CASE RVP LEVEL 10 PSI	 11 PSI
EVAPORATION FROM MOTOR VEHICLES*	30%	50%
GASOLINE MARKETING OPERATIONS	7%	13%

* BASED ON 1982 MODEL YEAR MIX

TYPICAL COSTS OF REDUCING GASOLINE RVP

	FROM 11 TO 9	FROM 10 TO 9
o AVERAGE ANNUALIZED COST TO REFINERS	$0.015 - 0.02 PER GALLON	$0.01 PER GALLON
o COST EFFECTIVENESS (DOLLARS PER POUND OF ROG)	0.5 - 0.6	0.7 - 0.8

- IN COMPARISON, VAPOR RECOVERY COSTS ARE:
  - $0 - 1.00 PER POUND FOR STAGE I
  - $0.30 PER POUND FOR STAGE II

NOTE: COSTS ARE IN 1982 DOLLARS

AGA American Gas
Association

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April 9, 1987

The Honorable George Mitchell
Chairman
Subcommittee on Environmental Protection
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

We listened with interest to testimony at the Subcommittee's hearing this morning on the feasibility of additional controls on mobile sources to assist in meeting the national ozone standard. The American Gas Association (A.G.A.) suggests that Congress consider the use of different, rather than additional controls on motor vehicles. In both vehicular and stationary source applications, natural gas offers an option to make significant strides in solving the ozone non-attainment problem.

Attached is our statement outlining the use of natural gas to control ozone precursors. We request that it be included in the hearing record of April 9, 1987.

A.G.A. looks forward to continuing to work with you and your staff as you search for effective solutions to our nation's air pollution problems.

Sincerely,

Robert K. Boyd
Director
Congressional Relations

STATEMENT OF

THE AMERICAN GAS ASSOCIATION

BEFORE THE

SUBCOMMITTEE ON ENVIRONMENTAL PROTECTION

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

UNITED STATES SENATE

ON POTENTIAL CONTROLS ON MOTOR VEHICLES UNDER

THE CLEAN AIR ACT

APRIL 9, 1987

The American Gas Association (A.G.A.) suggests that Congress consider the use of different, rather than additional, controls on motor vehicles under the Clean Air Act. Our views are outlined below.

THE USE OF NATURAL GAS TO CONTROL OZONE PRECURSORS

SUMMARY

- o Ground-level ("tropospheric") ozone is the most pervasive air pollution problem in the United States. At least one-third of the U.S. population lives in areas which exceed the National Ambient Air Quality (NAAQS) ozone standard.[1,2]
  - Nearly every major city is in "non-attainment," i.e., exceeds the ozone standard (see Exhibit 1).
  - Under the Clean Air Act (CAA), compliance with the ozone standard is required by year-end 1987. Sanctions for non-attainment are mandatory under the CAA, and include bans on new construction and cutoff of highway funds, among other measures. It is difficult to see how most urban areas can comply by the statutory deadline.[3]
- o In both vehicular and stationary applications, natural gas can contribute significantly to the solution of the ozone non-attainment problem.

- The combustion of natural gas generally produces far lower emissions of pollution that causes ozone than the combustion of other fossil fuels;
- In fact, natural gas offers the opportunity to simultaneously reduce emissions of all of the major contributors ("precursors") to ozone formation: nitrogen oxides, reactive hydrocarbons and carbon monoxide. (It has long been agreed that nitrogen oxides and reactive hydrocarbons contribute to ozone formation. In addition, several prominent scientists and regulators now believe that reducing carbon monoxide emissions will reduce concentrations of ozone and other oxidants.)[4,5]
- Emissions reductions can be rapidly implemented using natural gas, since many vehicular and stationary emitters already are capable of using natural gas or can be quickly converted.[6,7]

BACKGROUND

- Ozone is a highly reactive form of oxygen.
  - At ground level, it can irritate the nose and eyes, cause or aggravate respiratory disease, damage crops, and corrode many materials. While ozone is one of several harmful oxidants in the air, it is the only one addressed by EPA standards.[8,9] The current concern is that tropospheric ozone levels are too high.
  - At high altitudes ("stratosphere") ozone shields the earth from ultraviolet radiation. Some environmentalists are concerned that stratospheric ozone levels are being depleted, which could lead to an increased incidence of skin cancer and cataracts, as well as atmospheric warming.[10] This paper does not deal with stratospheric ozone.
  - While the tropospheric and stratospheric issues are distinct, they are related in complex ways. For example, depletion of stratospheric ozone leads to increased penetration of ultraviolet radiation which increases tropospheric ozone at ground level. Further, a given pollutant may have effects in creating and/or depleting ozone in both the troposphere and stratosphere.[11]
- Tropospheric ozone, the topic of this paper, is primarily formed by chemical reactions in the presence of sunlight between nitrogen oxides and reactive hydrocarbons such as gasoline vapors and chemical solvents.[12]

- Because ozone formation is very limited at temperatures below 65°F, the "ozone season" is summer. In the southwestern U.S. and Florida this may, in fact, be all year, but in most of the country it is May-October. Consequently, seasonal ozone control has been allowed by EPA in some instances.[13,14]

- The NAAQS for ozone is defined in terms of the daily maximum -- the highest average hourly value for the day. It specifies that the expected number of days per year with values greater than 0.12 ppm should not be greater than one.[15] An area is considered to be in "non-attainment" for ozone when it exceeds the ozone standard at at least one monitoring station more than one time per year on average over three years.[16]

ACHIEVING COMPLIANCE

The key to achieving ozone compliance appears to be in control of hydrocarbons, carbon monoxide, and nitrogen oxides. Significant progress will require reductions in all three. EPA Administrator, Lee M. Thomas has testified that "There is no single answer to the ozone problem."[17]

o The current major focus of attention is on vehicular HCs.

  - The two big sources of hydrocarbon emissions, transportation and industrial processes, contribute about equal quantities of pollution. Of 21.5 million metric tons of hydrocarbons emitted annually in the U.S., the breakdown is transportation 7.2, industrial processes (largely related to petroleum refining and distribution) 8.4, fuel combustion 2.6, non-industrial organic solvent use 1.8, solid waste 0.6, and miscellaneous 0.9.[18]

  - Methods of reducing hydrocarbon emissions which are under active consideration include increased at-the-pump gasoline controls (considered an industrial process emission); a tightened volatility standard on gasoline; on-board vehicle canisters; and, tightened vehicle exhaust emissions standards.[19]

  - The EPA is also considering a variety of measures to further control hydrocarbon emissions from stationary sources.[19]

o An important related issue is carbon monoxide:

  - Important, because carbon monoxide is the second most pervasive urban air pollutant, with 61.3 million persons living in non-attainment areas. In terms of tonnage it is by far the largest criteria pollutant, with annual U.S. emissions totaling 69.9 million tons.[20]

  - Related, because vehicles are the source of over two-thirds of carbon monoxide emissions, and because carbon monoxide is suspected of contributing to ozone formation.[21] Moreover, carbon monoxide is itself a highly dangerous pollutant, and the 1987 deadline to achieve compliance applies equally to carbon monoxide as to ozone.[22]

- Nitrogen oxides are the third major component in ozone formation.

  - Like ozone and carbon monoxide, nitrogen dioxide is a "criteria pollutant" subject to National Ambient Air Quality Standards (NAQQS). Non-attainment of NAAQS is, however, a much less widespread problem with nitrogen dioxide than with ozone and carbon monoxide.[23]

  - Total annual nitrogen oxides emissions are about 19.7 million metric tons.[24] Over 65 percent of all nitrogen oxides emissions stem from highway vehicles and large coal-fired facilities. While natural gas provides nearly one-third of total U.S. non-vehicular primary energy, only 14 percent of U.S. nitrogen oxides emissions result from natural gas delivery and use.[25,26,27]

THE ROLE OF NATURAL GAS

Natural gas use can significantly reduce emissions of carbon monoxide, nitrogen oxides, and hydrocarbons.

Vehicular Applications

- Conversion of gasoline or diesel fueled vehicles to natural gas can reduce carbon monoxide emissions by up to 99%, reduce nitrogen oxides emissions by up to 65%, and reduce reactive hydrocarbon emissions by up to 85%. This is particularly true for light trucks, some buses, and older cars, which account for 60-90 percent of vehicular emissions. Actual emissions reductions achieved depend upon a large number of factors including tuning, age and design of the vehicle, and the condition and technology of the gasoline emissions controls and natural gas conversion kit.[28,29]

  - For example, (see Exhibit 2) conversion of 1 million cars, approximately 10 percent of U.S. fleet vehicles, to natural gas could reduce carbon monoxide emissions by up to 223,000 tons/year, reduce nitrogen oxides emissions by up to 27,000 tons/year and reduce hydrocarbon emissions by up to 11,000 tons/year.

These vehicles would use less than 100 Bcf of natural gas per year -- one half of one percent of annual U.S. natural gas production.

- Stated alternatively, for each 1 trillion cubic feet (Tcf) of natural gas used annually in vehicles, carbon monoxide emissions could be reduced by up to 2.2 million tons annually (a 3% national reduction), nitrogen oxides emissions could be reduced by up to 270,000 tons annually (a 1% national reduction), and hydrocarbon emissions could be reduced by up to 110,000 tons annually (a .5% national reduction). Reductions of this magnitude, if focused in ozone non-attainment areas, could allow some areas to come into compliance.

o The cost of these emission reductions may vary from free (where fuel and maintenance cost savings offset capital costs of conversion) to several thousand dollars per ton of carbon monoxide. Reduction of other emissions may be thought of as a free bonus.

o Methanol is an alternative natural-gas based fuel. However, methanol vehicles may emit 100 times more carbon monoxide than natural gas vehicles (NGVs).[30] Emissions of aldehydes, suspected of posing risks to health and climate stability, may be 200 to 500 times as great with methanol as with gasoline.[31] Methanol is also a very inefficient vehicular use of gas--58% efficient use of primary energy compared to 80-88% for NGVs.[32] Furthermore methanol cannot be used (except for limited blending) in existing vehicles or in the existing fueling infrastructure. While conversion of existing vehicles to methanol is possible, corrosion and engine/spark plug fouling problems are formidable. Given the inefficiency, capital intensiveness, and other difficulties associated with methanol use, it is likely to be more costly than conversion to natural gas.

Stationary Applications

Natural gas use can also significantly reduce emissions of nitrogen oxides in a least-cost manner in many stationary applications. These applications include not only industrial boilers, combined cycle electric power generation, cogeneration, and a variety of new industrial technologies, but also the select use of gas specifically for emissions control purposes in new and existing boilers.

o Nitrogen oxide is a significant stationary-source ozone precursor.

- In most applications gas use produces one-third to one-half as much nitrogen oxides as comparable coal or oil use.[33] This advantage can be greatly enhanced by new technologies and select gas use.

o Using natural gas can be a highly attractive and cost-effective control technique with existing technology.

  - One of the easiest and most cost effective means of reducing NO_x emissions from stationary sources is the substitution of gas for residual oil in industrial boilers, which entails little or no equipment modification or capital expenditure. Approximately 3 quads of residual oil is consumed annually in industrial boilers, with NO_x emissions of at least 0.30 pounds per MMBtu.[33] Switching these boilers to gas, which emits only 0.14 pounds per MMBtu,[34] would result in NO_x reductions of over 50 percent for each Btu converted, with a potential attainable reduction of 240,000 tons per year.

  - The shifting of 3 quads from oil to gas in industrial boilers described above would reduce reactive HC emissions by over 350,000 tons per year (nearly 2 percent of total annual HC emissions) from the point of extraction to the point of consumption.

  - Natural gas-fired combined cycle electric powerplants are one of the most economical, efficient and environmentally benign sources of electricity available today. According to the National Electric Reliability Council, 87,000 MW of electric generating capacity will be added between 1986 and 1995.[35] If 24,000 MW, roughly one-fourth of this total, were to be provided by 100 combined cycle gas-fired power plants instead of the same amount of new coal-fired electric capacity with full NSPS controls, annual nitrogen oxides emissions would be lower by 105,000 tons (-43 percent, 135,000 tons/yr vs. 240,000 tons/yr).[36] Gas required for these units would total only 1 tcf/year, approximately 6 percent of U.S. gas production.

  - If the same 100 new gas-fired powerplants were to displace existing uncontrolled coal-fired powerplants, NO_x emissions would be reduced by up to 545,000 tons annually (-80 percent).

o A number of gas-based new technologies offer significant environmental advantages in both utility and industrial boilers.

  - Gas "reburn" not only realizes the benefits of the lower emissions levels normally associated with natural gas use, but it also uses gas to remove the air emissions resulting from coal combustion.

Reburning with a fuel mix that is 15 to 20 percent gas has been shown to reduce experimentally nitrogen oxides emissions by 50 to 60 percent.

Co-firing of natural gas with coal has been tested at the 570 MW Cheswick Powerplant. This program was initiated to investigate potential reductions in plant operating costs associated with coal burning, but environmental gains were observed as well.

Exhibit 1

National Exposure To Selected Pollutants

Population of Non- (Millions)	Total Annual Emissions (Million Metric Tons)	Attainment Areas
Ozone	21.5 (Reactive Hydrocarbons)	79.2
Carbon Monoxide	69.9	61.3
Nitrogen Oxides	19.7	7.5

Exhibit 2

Potential Reduction in Ozone Precursor Emissions Resulting From Conversion of 1 Million Gasoline Vehicles to Natural Gas

Pollutant	Annual Tons Emitted Gasoline	 Natural Gas	Potential Reduction* Annual Tons	 %
Carbon Monoxide	225,000	2,000	-223,000	up to 99%
Nitrogen Oxides	42,000	15,000	- 27,000	up to 65%
Reactive Hydrocarbons	13,000	2,000	- 11,000	up to 85%

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*Actual emissions reductions achieved depend upon a large number of factors including tuning, age and design of the vehicle, and condition and technology of the gasoline emissions controls and natural gas conversion kit.[28,29]

REFERENCES AND EXPLANATORY NOTES

1. Approximately half the U.S. population (110 million persons) live in Standard Metropolitan Statistical Areas (SMSAs) in which the ozone standard (NAAQS) is exceeded part of the time. Source: U.S. Environmental Protection Agency, *Review of the National Ambient Air Quality Standard for Ozone: Preliminary Assessment of Scientific and Technical Information*, Research Triangle Park, NC, March 1986, Appendix A-2.

2. An estimated 79 million people live in *counties* in which the ozone standard is exceeded. Source: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, *National Air Quality and Emissions Trends Report, 1984*, Research Triangle Park, NC, April 1986, p. 1-2.

3. "[EPA] analysis indicates that to reach near-term attainment, some high ozone areas would need to consider such drastic and far-reaching measures as shutting down or relocating major emitters, such as petroleum refineries. Advanced controls also may be needed for emissions from such small, widely dispersed sources as dry cleaners and bakeries.

   Because transportation-related pollutants play a significant role in the creation of ozone, it is possible that high ozone areas also may have to implement further transportation control measures to decrease the use of the automobile. These measures could include gas rationing, a significant tax on gasoline and on ownership of second vehicles, and mandated alternate drive days." Source: Thomas, Lee M., Administrator, U.S. Environmental Protection Agency, *Testimony Before the Subcommittee on Health and Environment, Committee on Energy and Commerce, U.S. House of Representatives*, February 19, 1987, p. 11.

   See also: U.S. Environmental Protection Agency, General Counsel, *Legality of the Sustained Progress Program and REEP Under the Clean Air Act*, A memorandum to the EPA Administrator, Washington, DC, November 26, 1986.

4. World Meteorological Organization, U.S. National Aeronautics and Space Administration, et. al., Global Ozone Research and Monitoring Project, *Atmospheric Ozone 1985*, Geneva, Switzerland and Washington, DC, 1985, Volume 1, pp. 2, 120.

5. "EPA Overlooking Carbon Monoxide in Guidelines?" *The Oil Daily*, March 9, 1987, p. 3.

6. For stationary applications: American Gas Association, *Survey of Industrial Fuel Switching and Dual-Fuel Capability: 1985/86*, Arlington, VA, May 9, 1986.

   Fay, James A., Golomb, Dan S., and Zachariades, Savvakis C., *Feasibility of Converting Oil- and Coal-Fired Utility Boilers to Intermittent Use of Natural Gas*, Cambridge, MA, Energy Laboratory, Massachusetts Institute of Technology, December 1986.

7. For vehicular applications: The Aerospace Corporation for the U.S. Department of Energy, *Assessment of Methane-Related Fuels for Automotive Fleet Vehicles*, Washington, DC, February, 1982, Volume 2, p. vi.

8. Thomas, Lee M., *Op. Cit.*, pp. 4-5.

9. U.S. Environmental Protection Agency, Office of Air and Radiation, *An Assessment of the Risks of Stratospheric Modification*, Washington, DC, January 1987 (draft), p. 5.

10. *Ibid.*, pp. 4, 22.

11. *Ibid.*, pp. 5, 13.

12. *National Air Quality and Emissions Trends Report, 1984, Op. Cit.*, p. 3-33.

13. *Ibid.*

14. U.S. Environmental Protection Agency, Regulatory Reform Staff, *RRS Fact Sheets: Seasonal VOC Control*, June 3, 1986.

15. *National Air Quality and Emissions Trends Report, 1984*, *Op. Cit.*

16. Thomas, Lee M., *Op. Cit.*, pp. 6-7.

17. Thomas, Lee M., *Op. Cit.*, p 9.

18. *National Air Quality and Emissions Trends Report, 1984*, *Op. Cit.*, p. 3-37.

19. Thomas, Lee M., *Op. Cit.*, pp. 8-11, and Exhibit: Control Strategies.

20. *National Air Quality and Emissions Trends Report, 1984*, *Op. Cit.*, pp. 1-2, 3-25.

21. *Atmospheric Ozone 1985*, *Op. Cit.*, p. 120.

22. Thomas, Lee M., *Op. Cit.*, p. 16.

23. Technically the NAAQS is for nitrogen dioxide. Much of the available literature and data does not differentiate between the nitrogen dioxide and nitrogen oxides. Source: *National Air Quality and Emissions Trends Report, 1984*, *Op. Cit.*, p. 4-2

24. *National Air Quality and Emissions Trends Report, 1984*, *Op. Cit.*, p. 3-30.

25. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, *National Air Pollutant Emission Estimates 1970-81*, Research Triangle Park, NC, September 1982.

26. American Gas Association, *Fact Book: Energy, the Environment and Natural Gas*, Arlington, VA, October 1983, pp. 14-15.

27. U.S. Department of Energy, Energy Information Administration, Monthly Energy Review, November 1986, pp. 7, 27.

28. It has been widely recognized that emissions, fuel economy and performance of NGVs relative to gasoline-fueled vehicles depend upon a large number of factors. For example, dual fuel vehicles may be tuned (e.g., spark timing, air-fuel ratio) to optimize any of emissions, economy or performance in either the gasoline mode or the natural gas mode. Alternatively, a compromise tuning may be effected. Tuning to minimize nitrogen oxide emissions is generally accomplished at the expense of sub-optimal carbon monoxide and hydrocarbon emissions, and vice versa. Substantial improvements can be obtained by using natural gas conversion kits which are specially designed for a given automobile make and model, and with factory built dedicated NGVs (single fuel).

    In spite of these and other factors, and in spite of the fact that most emissions testing has been performed on vehicles not optimized for natural gas, a wealth of data has made it generally accepted that emissions are greatly reduced in older vehicles when they are converted to natural gas. See, for example: Assessment of Methane-Related Fuels for Automotive Fleet Vehicles, Op. Cit., Volume 2, pp. 3-10 to 3-13, and Volume 3, pp. B-1 to B-41. It should be noted that roughly 60-90 percent of total vehicular emissions result from vehicles more than three years old. Derived from: Oak Ridge National Laboratory, Transportation Energy Data Book: Edition 7, Oak Ridge, TN, June 1984, pp. 2-12, 2-22.

    Recent models of passenger cars with such features as fuel injection, computer controlled engine sophistication, and emissions controls have greatly reduced the emissions resulting from gasoline fueling. When these sophisticated systems are working well, the relative emissions levels in the gasoline and natural gas modes are sometimes much closer. In extreme circumstances of tuning, condition, etc. emissions of nitrogen oxides, carbon monoxide or total hydrocarbons (see footnote 29) can even be higher with natural gas than with gasoline. It should be emphasized, however, that such circumstances require sub-optimal conversion and tuning. Even under such sub-optimal circumstances, natural gas would regain its advantage as the gasoline emissions controls and tuning degrade. By some (unsubstantiated) estimates, over 80 percent of gasoline-fueled vehicles on the road today have suffered significant degradation of performance of the emissions controls (due, for example, to use of leaded gasoline). It should be further noted that even the newest trucks (and other non-auto vehicles) are subject to far less stringent controls than autos, have less sophisticated technology, and have much higher emissions. (See Transportation Energy Data Book, Ibid.)

There is a great need for standardized emissions testing on high gasoline and alternative fuels under a spectrum of conditions (e.g., tuning, mileage of 50,000 miles and over). Two currently available sources are:

(A) Southwest Gas Corporation, City of Phoenix Tests, March 12, 1987. These tests were performed on a 1986 Dodge 350 van, by a California Air Resources Board approved testing facility. These tests found emissions reductions in natural gas operation (compared to using gasoline) of 61-84 percent in the case of carbon monoxide and 9-30 percent in the case of nitrogen oxides. (See footnote 29 for HC emissions).

(B) BC Research Ltd. for the Canadian Department of Energy, Mines and Resources, Exhaust Emissions Requirements of Natural Gas Fueled Vehicles, Vancouver, B.C., (Undated, circa 1986). This study examined emissions from three late-model vehicles using a variety of conversion kits and gasoline emissions controls. Its stated conclusions were that carbon monoxide emissions were generally reduced when using natural gas and that nitrogen oxide emissions were comparable for natural gas and gasoline.

It should be noted, however, that the section on Dodge 600 ES testing (with three way controls) found that, "The NO_x emissions for both kits decreased relative to the gasoline emissions, with extremely low emissions [reductions of up to 45 percent] of typically 0.5 grams/mile." (Ibid., p. 38.) These results are highly significant because most new American cars coming off the assembly line today utilize this type of emissions controls. Regarding the Ford test vehicle, the discussion stated, "The NO_x emissions were marginally decreased for all the kits relative to gasoline emissions." (Ibid., p. 33.) Other caveats to this study include the fact that vehicles used in the study all had new emissions controls and low mileage.

The bottom line appears to be that conversion to natural gas can reduce emissions in most vehicles under many circumstances.

29. Typically 85-95 percent of hydrocarbon emissions from NGVs are methane (Ibid., p. i). The relatively unreactive nature of methane makes it difficult to catalytically control, but it also makes it relatively benign as a pollutant.

This "non-reactive" nature of methane has long been recognized. See, for example, Assessment of Methane-Related Fuels for Automotive Fleet Vehicles, Op. Cit., p. 3-13. California has a non-methane emissions standard for vehicles. A federal non-methane vehicular standard was proposed by EPA in 1981, but has not been adopted.

The Southwest Gas tests referred to in footnote 28 found increased total HC emissions (including methane) of 5-75 percent when using natural gas. However, reactive HC emissions were reduced by 82-90 percent. The BC Research study found that total HC emissions were roughly the same with natural gas or gasoline. Non-methane emissions were thus reduced by 85-90 percent.

Some recent literature has argued that methane, being not totally unreactive at ambient temperatures, may play a role in ozone formation. See, for example, Atmospheric Ozone 1985, Op. Cit., pp. 117-120. While this may or may not be the case, atmospheric methane attributable to the natural gas industry is negligible. According to a paper entitled "Trace Gas Scenarios" presented at the UNEP Economic Workshop on the Ozone Layers in May of 1986, all human activities and fossil fuel usage are a source of only about 5 percent of all atmospheric methane. The remaining 95 percent is attributable to rice paddies (38 percent), wetlands (34 percent), enteric fermentation (e.g., cattle and sheep, 20 percent), and fresh water lakes, oceans and tundra (3 percent). Methane emissions from NGVs are and will remain negligible.

As systems designed and tuned for efficient natural gas operation become more common, even these negligible methane emissions will be reduced.

30. See, for example: Assessment of Methane-Related Fuels for Automotive Fleet Vehicles, Op. Cit., Volume 3, p. B-33, B-44.

31. Ibid., Volume 2, pp. 3-18.

32. See, for example: Ibid., Volume 2, p. 4-6, and American Gas Association, An Economic, Efficiency, and Environmental Comparison of Alternative Vehicular Fuels: 1983 Update, Arlington, VA, September 9, 1983, pp. 3 and 27.

33. The regional average SIP standard for a 100 MMBtu/hr residual oil boiler is 0.30 pounds per MMBtu in 7 EPA regions, 0.67 pounds per MMBtu in 1 region, and emissions are not regulated in the remaining 2 regions. See: U.S. EPA, Office of Air and Radiation, Small Steam Generating Units Background Information, Research Triangle Park, NC, February 1987.

34. U.S. EPA, Office of Air Quality Planning and Standards, Compilation of Air Pollutant Emission Factors, Research Triangle Park, NC, August 1982.

35. North American Electric Reliability Council, 1986 Electricity Supply and Demand, Princeton, NJ, October 1986.

36. Based on new source performance standards. See: 40 CFR Subpart Da, Part 60.40a through 60.43a, and Supart GG, part 60.330 through 60.333.

Exhibit 1-A

U.S. Ozone Concentrations by Standard Metropolitan Statistical Area
(Standard = 0.12 ppm)

Standard Metropolitan Statistical Area	Highest Concentration (ppm)**
New York, NY-NJ	.17
Los Angeles-Long Beach, CA	.29
Chicago, IL	.15
Philadelphia, PA-NJ	.20
Detroit, MI	.12
San Francisco-Oakland, CA	.15
Washington, DC-MD-VA	.14
Dallas-Fort Worth, TX	.16
Houston, TX	.21
Boston, MA	.15
Nassau-Suffolk, NY	.10
St. Louis, MO-IL	.17
Pittsburgh, PA	.11
Baltimore, MD	.15
Minneapolis-St. Paul, MN-WI	.12
Atlanta, GA	.15
Newark, NJ	.14
Anaheim-Santa Ana-Garden Grove, CA	.26
Cleveland, OH	.14
San Diego, CA	.15*
Miami, FL	.10
Denver-Boulder, CO	.12
Seattle-Everett, WA	.09
Tampa-St. Petersburg, FL	.13
Riverside-San Bernardino-Ontario, CA	.32
Phoenix, AZ	.15
Cincinnati, OH-KY-IN	.12
Milwaukee, WI	.16
Kansas City, MO-KS	.14
San Jose, CA	.16
Buffalo, NY	.12
Portland, OR-WA	.13
New Orleans, LA	.12
Indianapolis, IN	.12
Columbus, OH	.11
San Juan, PR	.08
San Antonio, TX	.12
Fort Lauderdale-Hollywood, FL	.10
Sacramento, CA	.16
Rochester, NY	.11
Salt Lake City-Ogden, UT	.17
Providence-Warwick-Pawtucket, RI-MA	.20
Memphis, TN-AR-MS	.13
Louisville, KY-IN	.15
Nashville-Davidson, TN	.13
Birmingham, AL	.11
Oklahoma City, OK	.12

Exhibit 1-A (CONTINUED)

U.S. Ozone Concentrations by Standard Metropolitan Statistical Area
(Standard = 0.12 ppm)

Standard Metropolitan Statistical Area	Highest Concentration (ppm)**
Dayton, OH	.12
Greensboro-Winston-Salem-High Point, NC	.11
Norfolk-Virginia Beach-Portsmouth, VA-NC	.12
Albany-Schenectady-Troy, NY	.09
Toledo, OH-MI	.11
Honolulu, HI	.07
Jacksonville, FL	.11
Hartford, CT	.17
Orlando, FL	.11
Tulsa, OK	.13
Akron, OH	.11
Gary-Hammond-East Chicago, IN	.15
Syracuse, NY	ND
Northeast Pennsylvania	.11
Charlotte-Gastonia, NC	.13
Allentown-Bethlehem-Easton, PA-NJ	.13
Richmond, VA	.13
Grand Rapids, MI	.11
New Brunswick-Perth Amboy-Sayreville, NJ	.19
West Palm Beach-Boca Raton, FL	.09
Omaha, NE-IA	.10
Greenville-Spartanburg, SC	.08*
Jersey City, NJ	.13
Austin, TX	.11
Youngstown-Warren, OH	.09
Tucson, AZ	.11
Raleigh-Durham, NC	.10
Springfield-Chicopee-Holyoke, MA-CT	.17
Oxnard-Simi Valley-Ventura, CA	.16
Wilmington, DE-NJ-MD	.14
Flint, MI	.09
Fresno, CA	.15
Long Branch-Asbury Park, NJ	ND

*Less Than 50% of Days in Ozone Season
**1-Hr 2nd High Daily Max, 1984
ND = No Data

Exhibit 2-A

U.S. Carbon Monoxide Concentrations by Standard Metropolitan Statistical Area
(Standard = 9 ppm)

Standard Metropolitan Statistical Area	Highest Concentration (ppm)**
New York, NY-NJ	15
Los Angeles-Long Beach, CA	19
Chicago, IL	11
Philadelphia, PA-NJ	10
Detroit, MI	11
San Francisco-Oakland, CA	8
Washington, DC-MD-VA	14
Dallas-Fort Worth, TX	7
Houston, TX	7
Boston, MA	10
Nassau-Suffolk, NY	10
St. Louis, MO-Il	7
Pittsburgh, PA	10
Baltimore, MD	14
Minneapolis-St. Paul, MN-WI	13
Atlanta, GA	8*
Newark, NJ	18
Anaheim-Santa Ana-Garden Grove, CA	10
Cleveland, OH	7
San Diego, CA	7*
Miami, FL	10*
Denver-Boulder, CO	20
Seattle-Everett, WA	10
Tampa-St. Petersburg, FL	7
Riverside-San Bernardino-Ontario, CA	7
Phoenix, AZ	17
Cincinnati, OH-KY-IN	7
Milwaukee, WI	12
Kansas City, MO-KS	13
San Jose, CA	10
Buffalo, NY	5
Portland, OR-WA	10
New Orleans, LA	9
Indianapolis, IN	9
Columbus, OH	8
San Juan, PR	7
San Antonio, TX	8
Fort Lauderdale-Hollywood, FL	8
Sacramento, CA	11*
Rochester, NY	5
Salt Lake City-Ogden, UT	11
Providence-Warwick-Pawtucket, RI-MA	11
Memphis, TN-AR-MS	10*
Louisville, KY-IN	12
Nashville-Davidson, TN	10*
Birmingham, AL	10
Oklahoma City, OK	13

Exhibit 2-A (CONTINUED)

U.S. Carbon Monoxide Concentrations
by Standard Metropolitan Statistical Area
(Standard = 9 ppm)

Standard Metropolitan Statistical Area	Highest Concentration (ppm)**
Dayton, OH	7
Greensboro-Winston-Salem-High Point, NC	11
Norfolk-Virginia Beach-Portsmouth, VA-NC	11
Albany-Schenectady-Troy, NY	7
Toledo, OH-MI	11
Honolulu, HI	6
Jacksonville, FL	8
Hartford, CT	12
Orlando, FL	7
Tulsa, OK	7
Akron, OH	5
Gary-Hammond-East Chicago, IN	6
Syracuse, NY	12
Northeast Pennsylvania	7
Charlotte-Gastonia, NC	13
Allentown-Bethlehem-Easton, PA-NJ	8
Richmond, VA	7
Grand Rapids, MI	5*
New Brunswick-Perth Amboy-Sayreville, NJ	8
West Palm Beach-Boca Raton, FL	4
Omaha, NE-IA	8
Greenville-Spartanburg, SC	ND
Jersey City, NJ	14
Austin, TX	ND
Youngstown-Warren, OH	5
Tucson, AZ	10
Raleigh-Durham, NC	17
Springfield-Chicopee-Holyoke, MA-CT	10
Oxnard-Simi Valley-Ventura, CA	5
Wilmington, DE-NJ-MD	8
Flint, MI	ND
Fresno, CA	14
Long Branch-Asbury Park, NJ	8

Note: N/O Non-Overlapping
*Less Than 4380 Hourly Values of Data
**2nd Max 8-Hr N/O Average, 1984
ND = No Data

Exhibit 3-A

U.S. Nitrogen Dioxide Concentrations by Standard Metropolitan Statistical Area

(Standard = 0.53 ppm)

Standard Metropolitan Statistical Area	Highest Concentration (ppm)**
New York, NY-NJ	.041
Los Angeles-Long Beach, CA	.057
Chicago, IL	.044 B
Philadelphia, PA-NJ	.040
Detroit, MI	.025
San Francisco-Oakland, CA	.028
Washington, DC-MD-VA	.032
Dallas-Fort Worth, TX	.016
Houston, TX	.029
Boston, MA	.044
Nassau-Suffolk, NY	.035
St. Louis, MO-IL	.035
Pittsburgh, PA	.031
Baltimore, MD	.035
Minneapolis-St. Paul, MN-WI	.019
Atlanta, GA	.027
Newark, NJ	.042
Anaheim-Santa Ana-Garden Grove, CA	.046
Cleveland, OH	.029
San Diego, CA	.014
Miami, FL	.009
Denver-Boulder, CO	.047
Seattle-Everett, WA	.033
Tampa-St. Petersburg, FL	.021
Riverside-San Bernardino-Ontario, CA	.040
Phoenix, AZ	.025
Cincinnati, OH-KY-IN	.030
Milwaukee, WI	.028
Kansas City, MO-KS	.018
San Jose, CA	.031
Buffalo, NY	.024
Portland, OR-WA	.016
New Orleans, LA	.026
Indianapolis, IN	.030
Columbus, OH	.024
San Juan, PR	ND
San Antonio, TX	.013
Fort Lauderdale-Hollywood, FL	ND
Sacramento, CA	.019
Rochester, NY	ND
Salt Lake City-Ogden, UT	.037
Providence-Warwick-Pawtucket, RI-MA	.025
Memphis, TN-AR-MS	.014
Louisville, KY-IN	.018
Nashville-Davidson, TN	ND
Birmingham, AL	ND
Oklahoma City, OK	.020

Exhibit 3-A (CONTINUED)

U.S. Nitrogen Dioxide Concentrations
by Standard Metropolitan Statistical Area
(Standard = 0.53 ppm)

Standard Metropolitan Statistical Area	Highest Concentration (ppm)**
Dayton, OH	.023
Greensboro-Winston-Salem-High Point, NC	.014
Norfolk-Virginia Beach-Portsmouth, VA-NC	.016
Albany-Schenectady-Troy, NY	ND
Toledo, OH-MI	ND
Honolulu, HI	.002
Jacksonville, FL	.016
Hartford, CT	.021
Orlando, FL	.010
Tulsa, OK	.018
Akron, OH	ND
Gary-Hammond-East Chicago, IN	.010
Syracuse, NY	ND
Northeast Pennsylvania	.020
Charlotte, Gastonia, NC	.015
Allentown-Bethlehem-Easton, PA-NJ	.024
Richmond, VA	.024
Grand Rapids, MI	ND
New Brunswick-Perth Amboy-Sayreville, NJ	ND
West Palm Beach-Boca Raton, FL	.015
Omaha, NE-IA	ND
Greenville-Spartanburg,SC	ND
Jersey City, NJ	.028
Austin, TX	ND
Youngstown-Warren, OH	.028
Tucson, AZ	.026
Raleigh-Durham, NC	ND
Springfield-Chicopee-Holyoke, MA-CT	.025
Oxnard-Simi Valley-Ventura, CA	.025
Wilmington, DE-NJ-MD	.032
Flint, MI	ND
Fresno, CA	.028
Long Branch-Asbury Park, NJ	ND

Note: For continuous instruments, the annual arithmetic mean is calculated if at least 4380 hourly values are collected. For instruments which collect only one measurement per 24-hr period (bubblers), the annual arithmetic mean is calculated if the data satisfies the NADB validity criteria or at least 30 days of 24-hr data (50% of the EPA recommended sampling days) have been collected.

ND = No Data
IN = Insufficient Data to Calculate the Annual Arithmetic Mean
B = Represents a 24-hr Bubbler Measurement
**Highest Annual Arithmetic Mean, 1984

Dingell II

U.S. House of Representatives
Subcommittee on Oversight and Investigations
of the
Committee on Energy and Commerce
Washington, DC 20515

March 10, 1986

Honorable Lee M. Thomas
Administrator
Environmental Protection Agency
Waterside Mall -- West Tower
401 M Street, S. W.
Washington, D. C. 20460

Dear Mr. Thomas:

Since writing to you on January 30, 1986 concerning a report of December 18, 1985 by the General Accounting Office (GAO) entitled "Air Pollution: EPA's Strategy to Control Emissions of Benzene and Gasoline Vapor," I received copies of letters that appear to bear out some of the criticisms set forth by GAO concerning the controversy at the Environmental Protection Agency (EPA) over the control of refueling vapors at the pump.

The first is a July 27, 1985 letter to you from the Dayco Corporation indicating that on July 22 "representatives from the vapor recovery equipment manufacturers and contractors" met with you "to present facts on the state of the art of vapor recovery equipment and the industry's capabilities to implement a nationwide Stage II program." Their presentation, along with a more recent presentation by the B.F. Goodrich Company, asserts that the "fourth generation vapor recovery" equipment in use in California is lighter, improved, more efficient, less costly, and most importantly, not objectionable to the public. Indeed, B.F. Goodrich states:

> Opponents of this technology have cited customer use problems and total expense of the system as major drawbacks to a country wide implementation. The facts do not support this argument particularly in view of the California experience. Research has concluded Stage II at the pump costs $.43 per lb. of hydrocarbon controlled verses Onboard controls at $.67 per pound. The fourth generation hose and nozzle designs are easily accepted by the consuming public. They are lighter and more efficient than previous designs. In fact, the new vapor recovery nozzle weighs only 3 to 4 ounces more than a standard non-vapor recovery nozzle.

NOTE: The following are the letters referred to and placed into the record by Senator Durenberger.

> There is no other proven technology that can equal Stage II vapor recovery at the pump for cost effective containment of VOC during automobile refueling. No other technology can be implemented as quickly nor with the flexibility of applying controls to non-attainment air quality areas like Stage II at the pump can. The technology works well. What remains now is implementation by the states that will not meet the NAAQS by the 1987 deadline.

What consideration has EPA given to these claims since last July? Are these claims true or are they exaggerated?

The second letter is a February 19, 1986 letter to EPA from a State official in the Department of Natural Resources' Division of Environmental Quality in Missouri where "Stage Two Vapor Recovery" (STVR) is being considered. That official comments that it is the State's "feeling that the reductions from STVR will be necessary in order to provide approvable attainment demonstration in our St. Louis Ozone State Implementation Plan (SIP)." In his letter, he states that on a number of occasions, he has "heard EPA personnel remark that there is no reason why EPA needs to provide backup for state STVR requirements." He then relates the following "difficulties" encountered by his agency at the State level which appears to be due, in part, to EPA inaction:

> The Air Conservation Commission has approved a revision to the St. Louis Ozone SIP that contains a commitment to STVR. USEPA has published a proposed approval of that plan in the January 28, 1986 Federal Register. A public hearing on a proposed STVR rule was held before the Air Conservation Commission on January 16, 1986. A vote for adoption was scheduled for Februray 20, 1986. Due to very intense loobying on the part of the gasoline marketing industry, a representative from the St. Louis area has proposed House Bill 1532, which I have attached for your information. This bill appears to be very similar, if not identical, to the Illinois STVR Prohibition Act. A senate counterpart bill is currently being considered and may come out in the next few days. In order to provide some breathing room for discussion with legislators on this issue, we have postponed the vote by the air conservation commission on the STVR rule until March 20th. Currently, we feel there is sufficient support within the commission to adopt the STVR rule when a vote is taken.
>
> Another Senate Bill, SB 713, has been introduced, which is designed to substantially reduce the powers of the Missouri Air Conservation Commission. The generally accepted point of view is that this bill is a retaliatory action in response to our STVR proposal.

> Industry in the St. Louis area has been controlled to at least all known RACT levels and are generally willing to support the need for STVR if that is what is necessary to avoid a construction ban on future industrial expansion. Yet, when these industries contact EPA sources at the headquarters level, they are told that the mandatory deadline may be pushed back and that EPA is looking at something like the California "reasonable further efforts program." This gives industry the feeling that sanctions won't be imposed and STVR support is therefore diffused.
>
> Like it or not, a perception felt by the legislators is that EPA has looked at STVR and doesn't seem inclined to think this necessary. Therefore, it can't be necessary for the state of Missouri, since both EPA and the State Air Program have the same environmental goals.
>
> The point in all of this is that some form of EPA support for STVR will be necessary if state level requirements for STVR are to pass. I urge EPA to provide some substantive support for this program. (Underlining supplied.)

While I generally believe that States, under the Clean Air Act, should "stand on their own two feet" and thus not rely on EPA buttressing their position, the above comments about EPA's indecisiveness and flexibility, not only in regard to the STVR, but also in regard to sanctions, give me concern. Here is a State agency that seems willing and able to take steps to comply with the law, but EPA appears to be undercutting that effort because EPA has not supported the STVR which gives support to pressure for the enclosed State bill.

1. I request EPA's comments on such State legislative efforts in light of the requirements of sections 105 and 110 of the Clean Air Act that require State agencies to be able to carry out SIPs in meeting attainment requirements. Is the January 28 proposed approval of the Missouri SIP intended by EPA as endorsement of the STVR? What is California's "reasonable further efforts program" and how is it applicable to this situation? What is the basis for EPA telling anyone that "the mandatory deadline may be pushed back"?

2. I also request an explanation about EPA efforts to help Missouri and New Jersey in developing and implementing Stage II controls for attainment. It is my understanding that New Jersey was to have such controls by February 1, but that effort has stalled. Please explain why and indicate what EPA has done to encourage the State effort.

3. Also, what is the status, including enforcement, of stage II controls in the District of Columbia? Are these controls enforced? Are they effective?

4. Please also provide a statement from your agency and the Administrator of the National Highway Traffic Safety Administration (NHTSA) about any safety problems or issues concerning the on-board system and the volatility issue expressed in the GAO report, taking into consideration Federal Motor Vehicle Standard 301. NHTSA has a copy of the GAO report and my earlier letter.

5. Also, please provide the average benzene content of gasoline. Is it technically and legally feasible for EPA to limit the average benzene content of gasoline? What are the problems for EPA and for refineries with establishing and enforcing such a limit? To what extent are exhaust benzene emissions as sensitive to other aromatic compounds in gasoline as they are to benzene? Do those compounds produce benzene during combustions or catalysis? Are all the compounds identified? Would their limitation also be wise? What would be the effect on public health from these limitations? What are the environmental effects (positive or negative) of methanol and alcohol gasoline blends regarding exhaust emissions?

I request your reply when you respond to my January 30 letter. Your staff requested an extension. I request your reply to both letters by March 27, 1986.

With best wishes.

Sincerely,

JOHN D. DINGELL
CHAIRMAN

Enclosure (1)

cc: Honorable James T. Broyhill
Ranking Minority Member

Honorable Charles A. Bowsher
Comptroller General
General Accounting Office

Honorable Diane K. Steed
Administrator
National Highway Traffic Safety Administration

SECOND REGULAR SESSION

HOUSE BILL NO. 1532

83RD GENERAL ASSEMBLY

INTRODUCED BY REPRESENTATIVE DAVID.

Read 1st time January 28, 1986 and 1000 copies ordered printed.

DOUGLAS W. BURNETT, Chief Clerk

[illegible]

AN ACT

Relating to the dispensing of gasoline

Be it enacted by the General Assembly of the State of Missouri, as follows:

Section 1. Neither the department of natural resources nor any other agency of this state shall make any rule or regulation which will require the use of Phase-II Vapor Recovery Systems at any gasoline dispensing facility within this state until the United States Environmental Protection Agency has determined that the use of such systems is required for compliance with the federal Clean Air Act, and any such rule which may have been adopted prior to the effective date of this act is expressly repealed.

passed out of committee in
original form on 2/12

[illegible]

U.S. House of Representatives
Subcommittee on Oversight and Investigations
of the
Committee on Energy and Commerce
Washington, DC 20515

[illegible]

Dingell
II

March 24, 1986

Honorable Lee M. Thomas
Administrator
Environmental Protection Agency
Waterside Mall -- West Tower
401 M Street, S. W.
Washington, D. C. 20460

Dear Mr. Thomas:

Enclosed for your information, review, and comment concerning the issues raised by the Subcommittee in our letters of January 30 and March 10, 1986 and the recent report of the General Accounting Office (GAO) on benzene and related matters is a copy of correspondence between the B.F. Goodrich Company and New Jersey's Department of Environmental Protection. The New Jersey letter is critical of your agency's alleged "delay in resolving the technical question of the best mechanism to control emissions during motor vehicle refueling," saying that this delay "has forced New Jersey into a somewhat untenable position."

The letter states that New Jersey "needs to adopt stage II controls this year." But it fails to explain why the failure of that State to do what its officials believe necessary, both from a legal and environmental standpoint, is attributable to EPA. I, again, request that you address that issue, taking into consideration the policies and requirements of the Clean Air Act, the applicable regulations, and the State Implementation Plan.

The New Jersey letter also notes that on-board controls, even if proposed now, would take a number of years to be installed on all or most applicable vehicles, taking into consideration lead time (once regulations are final) and the turnover of the fleet which apparently is not as rapid in this decade as in the 1960s or 1970s. I understand some estimates are as much as ten years to turn the on-the-road fleet over. In order to have some comparison, please provide, in your response to our correspondence, a table showing, as of the end of calendar year 1985, what percentage of the total number of passenger vehicles and light duty vehicles on the road nationally and regionally are operating in accordance with the most stringent pollution standards applicable in 1985 and your estimate when that percentage will reach 100 percent. Do you also agree with

New Jersey's comments that stage II equipment available today "would require replacement in seven to ten years, precisely the same time frame in which a national on-board program would become fully effective"? What is the basis for that view?

In regard to the on-board system, please explain what, if any, testing requirements your agency would impose and the related standard and indicate if your agency's cost estimates include the cost of meeting these testing requirements. Further, in evaluating the fuel economy and safety features or problems of such a system, please explain how the system will regularly purge the vapors and indicate the safety and fuel economy impacts thereof.

Finally, I note that the motor vehicle industry (domestic and foreign) is heavily engaged in applying its technical and financial resources for the purpose of complying with Federal Motor Vehicle Safety Standard 208. The effort is reportedly taxing that industry's suppliers significantly. I understand that other regulatory requirements are also being made applicable to that industry under the Clean Air Act and other laws regarding pollution, fuel economy, theft, and safety. What is the technical and financial capability of that industry (and its suppliers) to comply fully with all such requirements, including on-board controls, in the same or similar time frame, taking into consideration any changes in applicable provisions of the tax laws being proposed in the House-passed tax reform bill and now under consideration in the Senate? Please identify all such requirements under existing law for such model years, including their effective dates, types of vehicles to which they apply (i.e., passenger cars, heavy trucks, etc.) and the firms (domestic and foreign) affected by such provisions. I am sending a copy of this letter to Administrator Steed since the reply will require input from her agency.

Please provide a copy of your reply to the GAO for its review and comment to the Subcommittee.

With best wishes.

Sincerely,

JOHN D. DINGELL
Chairman
Subcommittee on
Oversight and Investigations

Enclosures (2)

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
GEORGE J. TYLER, ASSISTANT COMMISSIONER
CN 027
TRENTON, N.J. 08625
609 - 292 - [illegible]

March 4, 1986

Ms. Kathleen E. Stimler
Manager of Government Relations
B. F. Goodrich Company
500 South Main Street
Akron, Ohio 44318

Dear Ms. Stimler:

Commissioner Dewling has asked me to respond to your letter of February 11, 1986 regarding stage II vapor recovery.

There are two methods available to control gasoline emissions during automobile refueling: (1) stage II control, which is the shorthand name for air pollution control built into gasoline pumping systems; and (2) on-board control, which is the shorthand name for canisters installed "on-board" new cars. There is a debate between the automobile industry and the oil industry as to the most appropriate method; each industry is attempting to convince the United States Environmental Protection Agency (EPA) that the other should bear the burden of installing these controls.

EPA's delay in resolving the technical question of the best mechanism to control emissions during motor vehicle refueling has forced New Jersey into a somewhat untenable position. The New Jersey Department of Environmental Protection (DEP) is required by the Federal Clean Air Act and its own State Implementation Plan to adopt regulations, including stage II controls, despite the fact that if and when EPA eventually opts for an "on-board" program, our decision will appear to have been unnecessarily duplicative and unnecessarily expensive for gasoline stations.

New Jersey needs to adopt "stage II controls" this year for two reasons:

1. The first is simply New Jersey's desire to meet our legal commitments under the federal Clean Air Act and our intent to avoid the serious sanctions EPA can impose on New Jersey if we fail.

2. More importantly, there are significant toxic emissions associated with gasoline refueling. Either stage II or on-board controls will control those toxic emissions. But we believe it is necessary to move ahead immediately, thus limiting our choice to stage II, since it will take seven to ten years for the entire national fleet to be equipped with on-board controls.

In the long term, a national on-board program to control toxic emissions during motor vehicle refueling is the best option for New Jersey. Carbon canisters installed on automobiles can be highly effective in reducing public exposure to toxic volatile organic substances in gasoline, including benzene, ethylene dibromide, and ethylene dichloride. On-board controls will reduce volatile organic substance emissions from all new cars sold nationwide, giving New Jersey the added benefit of reducing the emissions transported into the state from other states. Consequently, we have urged EPA to mandate nationwide on-board controls of vehicle refueling emissions without delay.

This is not inconsistent with adoption of stage II controls now in New Jersey. The equipment involved would require replacement in seven to ten years, precisely the same timeframe in which a national on-board program would become fully effective.

Should you have any further questions, feel free to contact Dr. Donald A. Deieso, Director of the DEP's Division of Environmental Quality, at CN 027, Trenton, New Jersey 08625.

Sincerely,

George J. Tyler

George J. Tyler
Assistant Commissioner

c: Director Deieso

0115
WHB-6

March 13, 1986

Mr. George J. Tyler
Assistant Commissioner
State of New Jersey
Department of Environmental Protection
CN 402
Trenton, New Jersey 08625

Dear Mr. Tyler:

Thank you for your response of March 4 to my letter regarding New Jersey's adoption of Stage II vapor recovery, and for informing me that the state has decided to finalize its Stage II rulemaking this year. As you suggested, I contacted Dr. Deieso's office and learned that publication of the final rule adopting Stage II is expected in April 1986.

Please know that I do appreciate the fact that USEPA's 13-year long evaluation of the two methods of controlling automobile refueling emissions has been at the heart of much of the delay and confusion experienced by state environmental agencies faced with meeting legal requirements under the Clean Air Act. However, some of the confusion also stems from myths about Stage II which have been hard to dispel.

One of those myths is that Stage II is costly to maintain. Our experience in California is that Stage II hose lasts between 5 to 7 years, and in some cases even longer depending upon service station care and maintenance. At an estimated $115.00 per coupled Co-Ax® hose (once every seven years or more), it is hard to view this control equipment as anything but cost-effective. This is especially true because nozzles and hose must be replaced -- regardless of whether a station has Stage II or not. Furthermore, nozzles and hose are expendable (vs. capital) items.

Stage II tanks and plumbing will not need replacing in 7-10 years, and in fact will last considerably longer in the life of a station. The costs of Stage II are felt at the point of installation, but even these costs can be depreciated and are sometimes eligible for state and federal tax credits. The only maintenance involved which is unique to Stage II is the replacement of the accordian boot and face plate at an approximate average cost of $20.00 per year.

Page 2

It is not our position that on-board controls and Stage II controls are mutually exclusive. However, Stage II is a proven technology which is commercially available and 95% effective. Stage II produces immediate benefits by reducing exposure to gasoline vapors. And, Stage II can significantly contribute to the state's attainment of the national ozone standard by 1987, as well as be an important control technique for "borderline" attainment areas which would like to attract new business to the state, but may not have enough "room for growth." In summary, we believe that New Jersey has made a difficult, but wise decision in the absence of clear federal guidance.

Thank you again for your letter of March 4. Please do not hesitate to call upon us if we can be of any assistance.

Best regards,

Kathleen E. Stimler

Kathleen E. Stimler
Manager, Government Relations

rs/3500y

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U.S. House of Representatives
Subcommittee on Oversight and Investigations
of the
Committee on Energy and Commerce
Washington, DC 20515

Dingell III
(response to
EPA response)

RECEIVED MAY 1 1986

April 11, 1986

Honorable Lee M. Thomas
Administrator
Environmental Protection Agency
Waterside Mall -- West Tower
401 M Street, S. W.
Washington, D. C. 20460

Dear Mr. Thomas:

Thank you for your very detailed and helpful reply (and enclosures) of March 31, 1986 letter concerning the General Accounting Office's (GAO) December 1985 report on actions by the Environmental Protection Agency (EPA) on benzene and gasoline vapors and related matters. We are examining your reply and undoubtedly will be in further communication after our examination and after receiving your reply to our subsequent letters concerning these matters. We note that you also provided a copy of your reply to the GAO for their review and comment to the Subcommittee.

Because the information you provide is quite helpful, we think you should make the letter and enclosures publicly available this month. Please provide to the Subcommittee a copy of any comments you receive as a result of any such availability to the public. We are also providing copies of this letter and your letter to the National Governors' Association and the State and Territorial Air Pollution Program Administrators for their review and comment to the Subcommittee.

We note your views on pages 33 and 35 that EPA "does not believe" it "has to issue Stage II guidance to include the program in an ozone plan as a locally needed, reasonably available measure." We certainly do not disagree. However, the States either seem to believe such guidance is needed or are confused because EPA seemingly left the impression that an "onboard" technology is preferable. That confusion is certainly not eased by EPA's statement at page 36 that "EPA standards are not required for the States to implement Stage II control for ozone purposes, although some sort of guidance probably would be helpful" or by the following at page 33 - 34, and 49:

Given that a proposed rule has yet to be issued, a fuel volatility standard for January 1, 1987 or even the summer of 1987 does not appear feasible, even if deemed appropriate. Volatility standards beginning in the 1988-90 timeframe may be feasible, depending on the timing of the decision and the stringency of the standards.

The current evaporative emissions can be reduced either through commercial Reid vapor pressure (RVP) controls or vehicle modifications; both approaches have the potential for significant hydrocarbon (HC) reductions. Because commercial fuel control has an immediate impact on the entire vehicle fleet (unlike strategies that affect only new vehicle design), greater short-term emission reductions are achievable via this strategy.

* * *

In order for an onboard requirement to be effective for the 1989 model year, a final rule would probably be needed by this fall. This implementation schedule would provide manufacturers with 24 months of leadtime. Therefore, the earliest an onboard requirement would likely be effective would be the 1990 model year.

At this point, neither onboard controls nor Stage II controls can be in place in time to assist in meeting the 1987 ozone goals for non-attainment areas. Nevertheless, it is clear that onboard controls would provide substantial reductions in refueling emissions nationwide, especially in the long run. In the post-1987 timeframe, these reductions could assist compliance in the many non-attainment areas which are unlikely to meet the ozone standard by 1987 and would also help to assist in offsetting the effects of growth in attainment areas. In addition, nationwide onboard controls would reduce emissions of hazardous substances which are part of the gasoline vapor (e.g., benzene), thus leading to reductions in any adverse health effects arising from exposure to these pollutants. Thus, onboard refueling controls could be valuable from both an ozone and a health effects perspective.

* * *

With regard to the pervasive ozone nonattainment problems, it is becoming clear that a range of measures will be needed to make meaningful progress. Candidate measures include controls on vehicle refueling and fuel volatility. In this context, they are linked.

> Moreover, if onboard were the method designated for refueling control, the in-use volatility of fuel would have to be established at the time of promulgation of an onboard requirement, since onboard design parameters depend in part on fuel volatility. There is less of a direct tie between Stage II and volatility controls, since changes in volatility have no effect on Stage II design.
>
> EPA has not determined the proper volatility levels for either in-use or test fuel. Generally speaking, the two should be matched, but at what level is still under evaluation. Written comments on EPA's volatility study are not due until March 27, and substantial analysis will still be required before a decision can be made. (Underlining supplied.)

The confusion is undoubtedly shared by others. But, of particular concern is the apparent suggestion that an on-board system will be the savior and make Stage II unnecessary in non-attainment areas. Given the long-time for turn-over of the applicable motor fleet (as noted in our recent letter), we question that suggestion and request that you address this issue directly in your subsequent response taking into consideration the article in the March 28, 1986 edition of Inside E.P.A. entitled "EPA Shelves Gas Marketing Proposal Pending RVP, Ozone Control Decision."

In regard to safety discussed at page 43 of the EPA reply, enclosed is a letter we received from the Administrator of the National Highway Traffic Safety Administration (NHTSA) which indicates that NHTSA's involvement with your agency in this matter has, until very recently, been nearly non-existent. That is troublesome, because EPA has no expertise in this area. We are pleased that NTHSA's involvement is becoming more active. Both agencies should keep us currently informed about their findings regarding safety and fuel economy. We look forward to your "separate letter" on this matter.

In regard to your brief reply to question 13, it is not clear to what extent and how EPA will carry out the GAO recommendation. Indeed, EPA states: "we will evaluate ranges of values where such analysis can provide greater insight and contribute to a sound decision." That response seems equivocal. It also leaves the impression that EPA will devise ranges directly or by contract and possibly not include those developed by others, such as the auto makers, and if EPA finds that they do not provide such "insight" or "contribute to a sound decision," EPA might abandon them. We hope that is not EPA's intention.

Finally, your reply to our question 1 (together with your letter of December 19, 1985) is helpful, except it fails to discuss in any detail the cost effects of the requirements of sections 112 and 307 of the Clean Air Act. We request that you identify all those requirements and indicate how they affect costs and time.

We also note the following comment:

> In general, the high cost of NESHAPs is due to the large amount of information that is collected in order to do a credible regulatory impact analysis. A typical NESHAPs analysis might include risk assessments, economic analysis, market analysis and sensitivity analysis to assess worst case impacts. Because NESHAPs apply to existing as well as new sources, substantial site-specific data collection is necessary in some cases in order to understand the full impact of alternative standards. This can be very costly.

Are you suggesting by this comment that such "analysis" is too costly and possibly should be avoided? How does it compare, in terms of costs, to other regulatory actions by EPA or other Federal agencies where such an analysis is required?

Your early reply to our other letters and this letter will be appreciated. Please provide a copy thereof to the GAO. Again we commend you and your able staff for the effort in providing the helpful and timely March 31 reply.

With best wishes.

Sincerely,

John D. Dingell
Chairman
Subcommittee on
Oversight and Investigations

Enclosure (1)

cc: Honorable James T. Broyhill
Ranking Minority Member
Subcommittee on Oversight and Investigations

Honorable Diane K. Steed
Administrator
National Highway Traffic Safety Administration

Honorable Charles A. Bowsher
Comptroller General
General Accounting Office

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

EPA
response

MAR 31 1986

THE ADMINISTRATOR

Honorable John D. Dingell
Chairman, Subcommittee on
  Oversight and Investigations
Committee on Energy and Commerce
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

This is in response to your January 30, 1986 letter concerning the General Accounting Office's (GAO) December 1985 report on EPA actions to evaluate and control emissions of benzene and gasoline vapors. Enclosed are responses to the questions you asked. Several of your questions highlight the problems we face in striking a balance between the need and desirability of having good data on emissions and health effects to support our regulatory decisions and the time and resources it takes to generate such data (with the resulting adverse effects on public health and welfare resulting from a delay in regulation). In the case of the Agency's benzene and gasoline marketing activities, I believe that the data gathering efforts have been appropriate to support the different types of decisions that have been made throughout the regulatory process.

With regard to the portion of your Question 12(g) concerning fuel-related problems that do not affect emissions, we are working with the National Highway Traffic Safety Administration and will respond to this question in a separate letter.

As you requested, we will consider GAO's findings and recommendations in our future decisionmaking on benzene and gasoline marketing and in other air toxics decisions. Also as you previously requested, enclosed is our quarterly update of the status of air toxics under consideration for listing and/or regulation (Attachment 7).

Sincerely,

Lee M. Thomas

Enclosures

Question 1

At the onset, let me express concern about the cost involved in the listing and setting of benzene standards under section 112 of the Clean Air Act and the apparent resource intensive nature of this effort. According to the GAO, EPA has committed over $6.1 million between fiscal years 1977 and 1985 for this substance and there is no final resolution as yet. That is a staggering sum and a long time, particularly if expenditures of a similar magnitude are required for all substances slated for possible standard setting under section 112 of the Clean Air Act and considering the impact of the Gramm-Rudman law.

Please explain why this process is so costly, timeconsuming, and resource intensive and what EPA is doing to reduce these costs, etc., significantly for other substances. Are there alternative controls that are as effective? To what extent are these costs driven by the requirements of sections 112 and 307 of the Act, taking into consideration the "lengthy process" described in your December 19, 1985 letter to the Subcommittee? What are the expenditures (and over what period) for each of the other 20 substances considered under section 112 to date by your agency? What future expenditures are required for substances now listed and those that you intend to list? What is the impact of Gramm-Rudman on section 112?

Response to Question 1

Our December 19, 1985 letter to you attempts to explain why it requires a minimum of 4 years to develop a standard under section 112. Historically this process has cost about $1.1 million in extramural dollars for a NESHAP to cover a source category. Since we have gone through rulemaking for five source categories of benzene, that was equivalent to about five NESHAPs. In the case of benzene, there was another factor that added to the cost and time to complete our rulemaking--the switch to a risk assessment/risk management approach to standards setting. For the maleic anhydride, ethylbenzene/styrene, storage, and fugitive NESHAPs, significant work had been accomplished under the "technology based" approach to standards setting that is described by GAO. Three NESHAPs had been proposed and a fourth was very close to proposal. As a result of this shift in policy, additional analyses were needed and all four regulatory packages were redrafted at a point after the rulemaking packages were in final form and ready for publication in the Federal Register.

As was indicated in our December 19, 1985 letter, we are investigating ways to expedite the NESHAPs process. We are considering both policy and procedural changes to the process in an attempt to reduce both the time and costs for producing NESHAPs. While it is too early to know how successful we may be, I expect that we should reach some decisions on this issue soon.

In general, the high cost of NESHAPs is due to the large amount of information that is collected in order to do a credible regulatory impact analysis. A typical NESHAPs analysis might include risk assessments, economic analysis, market analysis, and sensitivity analysis to assess worst case impacts. Because NESHAPs apply to existing as well as new sources, substantial site-specific data collection is necessary in some cases in order to understand the full impact of alternative standards. This can be very costly.

The cost required to evaluate pollutants and to reach a decision on whether to regulate spans a wide range depending upon the complexity of the issues, the amount of information already available and the national scope and extent of the emission sources. For example, the August 1983 GAO report ("Delays in EPA's Regulation of Hazardous Air Pollutants," p.24) presents information on the variability of costs through March 1983 for Health Assessment Documents (HAD). With regard to the listing process, we do not usually segregate costs specifically by chemical because so many candidates are normally being evaluated at one time. Rather, we allocate resources generally to the various evaluation and process steps that we undertake for listing, each of which may contain a number of pollutants. Thus, we can best estimate average cost per pollutant for each process step with the understanding that the actual cost for any pollutant can vary above or below the estimate. The average extramural costs to reach a regulatory decision for the 22 pollutants for which we have published decisions between June 1984 and December 1985 are summarized in Table 1. The period over which these expenditures took place ranged from 2 to 8 years. Start dates for these assessments are specified on p. 16 of the August 1983 GAO report and completion dates were generally in the last 6 months of 1985, except for the three decisions issued in mid-1984 (toluene, POM and coke oven emissions). Average costs for future pollutants are shown in Table 2, which reflects recent decisions to issue most "no regulate" decisions on the basis of a more abbreviated Health Summary rather than a comprehensive HAD.

Any predictions of future expenditures for NESHAPs are highly uncertain, because at this time we do not know how many NESHAPs will result from our intent to list (ITL) decisions. For the 10 compounds for which ITL have been announced, we will evaluate about 60 source categories for possible NESHAPs. While these source category evaluations are not scheduled for completion until the end of FY 86, we currently estimate that about 10-15 source categories will warrant NESHAPs development. Depending on the results of our study, the number of NESHAPs needed could be substantially more or less. Resources depend directly on the number of individual NESHAPs that are required. We estimate contract dollars required on these projects from FY 1986 through promulgation of all currently active NESHAPs in FY 1990 to be between $15-20 million, depending on the amount of source testing that ultimately is necessary. This estimated is based on assumptions that:

(1) about 10-15 NESHAPs will result from the current ITL decisions, and

(2) we will continue ongoing NESHAPs development for vinyl chloride, coke oven emissions, benzene, asbestos, and arsenic.

Of course, we do not yet know the effects of Gramm-Rudman on our NESHAPs budget for future years. We have prioritized the source categories that emit the 10 compounds that we intend to list and are proceeding to develop NESHAPs for those source categories that pose the highest risk to public health. Source categories for which there are no resources will be considered in future years' budgeting decisions.

ESTIMATED CONTRACT RESOURCES FOR TOXIC AIR POLLUTANT ASSESSMENTS[1]

TABLE 1

Previous 22 Pollutants

ACTIVITY	AVERAGE COSTS ($ per pollutant)
Health Assessment (up through 3/83)	$ 166,000[2]
Health Assessment (from 3/83 to 12/85)	54,000
Source/Exposure Assessment	80,000
	$ 300,000

TABLE 2

Future Pollutants

Pollutants to be Regulated	
Health Assessment	$ 200,000
Source/Exposure Assessment	$ 90,000
	$ 290,000
Pollutants Not Regulated	
Health Assessment	$ 50,000
Source/Exposure Assessment	$ 10,000
	$ 60,000

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[1] Funds needed to reach a decision on whether or not to regulate (e.g., Intent to List under section 112.)

[2] Source: August 26, 1983 GAO report.

Question 2

The GAO report confirms what Mr. Ruckelshaus told the Subcommittee at our 1983 hearing that he had "shifted EPA's hazardous air pollutant standard-setting process away from a technology-based approach in favor of a risk-based approach." It states that this June 1983 EPA "decision" is consistent with a 1983 National Academy of Sciences report ... that recommended risk assessment and risk management be used by regulatory agencies dealing with scientific uncertainties." Under this EPA policy, "risk to the public is the overriding factor used in the decision," although the policy "requires information on control technologies, their effectiveness, and costs." The GAO report (pages 24 - 29) discusses EPA's handling of health data concerning benzene which gives the Subcommittee concern. The report indicates that EPA "planned to reevaluate all recent data on benzene health risks" and issued a final report last month. The Science Advisory Board (SAB) is to review the "EPA analysis of the new benzene health data." Was this reevaluation done by EPA employees or by contract? What is its status and the schedule for SAB review and report? What will be the next action by EPA and when? What is the relationship of this analysis to the petitions filed administratively and in court? What is the status of those proceedings?

Response to Question 2

In February 1985, the Cancer Assessment Group (CAG) completed an interim quantitative analysis which included studies that had not been available when the benzene regulations were promulgated. That update resulted in an increase in the potency estimate (and thus risk) for benzene of 18%. That update was conducted to respond to the NRDC petition asking the Agency to reassess its potency estimate for benzene. Recognizing that the update was based principally on secondary sources of information, the Chairman of CAG proposed to conduct a more thorough analysis, as time permitted, to examine and evaluate the primary references relevant to the derivation of the potency estimate as well as to update the available information on toxicology and mutagenicity. Although the reevaluation is underway, using both in-house and contract resources, there is at present no fixed date for its completion or for subsequent SAB review. The EPA does not believe that this re-analysis is essential to any near-term decisions.

The next actions affecting benzene emissions by EPA will be a decision on the need for regulation of the gasoline marketing system expected this spring and promulgation of the coke by-product plant emission standards scheduled for December 1986.

The reevaluation is not directly related to the petitions filed by the Natural Resources Defense Council (NRDC). The update published in February 1985 appropriately addressed the concern raised by NRDC that the original risk estimate for benzene was not based on the most current scientific information. The Administrator relied on the update when he denied NRDC's administrative petition for reconsideration (50 FR 34144, August 23, 1985).

The petitions for review filed by NRDC with the D.C. Circuit challenging the 1984 benzene decisions and EPA's denial of the petition to reconsider those decisions are pending before that Court.

Question 3

GAO states that "emission and population data used in its benzene decision were not always accurate" and modeling of benzene health and exposure data was based on several assumptions that add to the uncertainty of the benzene risk assessment numbers. Based on its review of EPA files and site visits of plants affected by proposed standards, GAO shows that data were "not current or were based on assumptions" never verified. On prior occasions, we, like GAO, noted that EPA has ample authority under section 114 of the Act to get needed data and verification. EPA never disagreed. But there is little evidence that this authority is often used in regard to standard setting. Costs are cited for not doing so. But there is also a cost in data that are relied upon not being accurate. What are the so-called costs factors? When is section 114 used? What, if any, reasons exist as to why it is not useful in listing substances or setting standards under section 112? The GAO says:

> Topographical maps are another resource available for verifying population estimates. The maps show industrial, residential, and commercial areas near emission sources. EPA sometimes utilizes these maps to better estimate precise locations of emission sources and the population exposed to emission sources of hazardous air pollutants. EPA did not use this resource for developing benzene exposure data for its December 1983 decision because it considered its modeling data sufficient for estimation purposes. However, in September 1985 EPA officials told us that they had recently used topographical maps in reviewing its proposed standard for coke by-product recovery plants. They told us that the maps improved their accuracy and that EPA plans to use them more extensively in the future.

EPA should examine other ways, like this one, to ensure that its data are accurate. Please explain why such maps have only recently come into use and when EPA will use them.

Response to Question 3

Section 114 is a very useful authority, and we use it routinely in setting standards both under section 111 and section 112 of the Act. Section 114, however, is not the only method available for collecting information. Other methods include published literature, information from State and local air pollution control agencies, plant inspections, public comments, telephone surveys, and EPA-sponsored emission testing. Generally, we exhaust readily available sources of information and then use section 114 to fill in critical information gaps. While we are aware that section 114 includes the authority to require plants to conduct emission tests, we have not used this provision in the past. One of the primary reasons for not requiring plants to do emission tests is that if the data are to be used in standards setting, we must be assured that testing protocols are carefully followed. In addition, the plant operating parameters must be within certain ranges and must be carefully monitored and correlated with the emission testing. Since emission testing frequently requires expertise beyond the capability of many companies, we could not be assured the company-acquired data would withstand future technical and judicial scrutiny. However, we are considering the use of section 114 in selected situations where we feel the companies could provide high-quality data in order to reduce the costs of standards development.

In the case of benzene, EPA gathered an extensive amount of information on the four benzene source categories, using section 114 and other methods. We continue to believe that the conclusions on which we based the benzene decisions are justified by the record and that additional verification of the facts was not warranted. Our decision not to pursue additional verification on benzene was based on confidence in our approach and conclusions, not any cost factors as cited by GAO.

The increasing use of topographical maps to verify source location, the location of nearby residences, and terrain features is a direct result of the growing importance of risk assessment in the decision process. In the early stages of benzene regulatory development, the procedures for risk estimation were not considered sufficiently developed for such estimates to play more than a limited role in making regulatory decisions. As this role expanded, it became clear that additional efforts should be made to support and validate the estimates.

The topographical map system is now routinely consulted in cases where the location of a particular source is uncertain. The system is also used to verify the location of residences where maximum long-term concentrations are predicted, and to provide information, where available, on source configuration and adjacent terrain features. The latter may be of particular importance in situations where terrain is complex.

Question 4

According to EPA, "it is not possible to directly link actual human cancers with ambient air exposure to chemicals, such as benzene," thus EPA "relies on mathematical modeling techniques to estimate human health risks." EPA used a simplified model which has "limitations." Both the simplified and complex versions "assume that (1) people are exposed for 70 years, (2) the population is immobile, (3) sensitive populations are not represented, (4) the terrain is flat, (5) the emissions are constant, and (6) exposure occurs at computer-generated 'population centroids' rather than precise locations." GAO states:

> According to an engineer in EPA's Pollutant Assessment Branch, EPA can improve its model by accounting for potentially sensitive groups, population, mobility, and terrain differences. EPA had a contractor evaluate the feasibility of making these improvements. EPA officials told us in September 1985 that they had decided to improve the model but had not yet determined the extent to which the improvements would be made. They expected to make a final decision on this issue in late 1985.

Please explain when, how, and to what extent EPA will improve this model. What will be the cost and how long will it take? What limitations will remain? Is the model used for all 112 substances? When was the model developed and at what cost? Were these limitations recognized then?

Response to Question 4

The EPA has taken initial steps to improve the air programs exposure and risk assessment models used for toxic air pollutants. A feasibility study has been completed and reviewed, and funds for initiating this task have been allocated for FY 86. This project will take approximately 18 months and $250,000 to complete. Improvements to the Human Exposure Model (HEM) will address many of the major simplifying assumptions found in the present model. These include: (1) variation of emissions with time, (2) simulation of population mobility, (3) definition of indoor and outdoor microenvironments, and (4) identification and consideration of sensitive populations.

Undoubtedly, limitations will remain, even with an improved assessment model. Much of the health information is derived from animal to man extrapolations or from extrapolations from occupational environments (characterized by healthy male workers exposed to fairly high but often unknown levels of a substance) to the ambient environment (characterized by the young, old, infirm, diverse genetic backgrounds and, in some cases, poor diets). Many of the improvements to HEM will help to reduce uncertainty in the modelling and exposure assessment elements of the analysis.

The first version of HEM was developed in 1979 by Systems Applications, Inc. (SAI). SAI developed the methodology, the population data base and meteorological data base, and also estimated population exposure to approximately 30 substances and groups of substances at a total cost of $270,000. Since 1980, several significant modifications have been made to HEM. A brief list includes: incorporation of 1980 census data, ability to interface with more sophisticated dispersion models, addition of several other meteorological stations, and the ability to model prototype plants and area sources in limited geographic areas as well as nationally.

The limitations on defining a sensitive population, lifetime exposure, constant emission rate, and immobile population were recognized during the development of the HEM. However, HEM was developed as a nationwide screening model to address a large number of chemicals and sources in an efficient manner. The EPA feels that HEM does do the job for which it was designed very well. Problems can arise when HEM is not used in a manner consistent with the quality of the input data. For example, some of the simplifying assumptions break down when the model is applied to a single source in the absence of good quality site-specific information. In any application, the estimates provided by the HEM should be interpreted carefully with consideration of the amount and quality of the input data.

Question 5

GAO states that EPA's Pollutant Assessment Branch plans to develop an operating manual this fiscal year. GAO's recommendation is:

> To improve the risk assessments for hazardous air pollutants, such as benzene, we recommend that the Administrator, Environmental Protection Agency, direct that the proposed Operating Manual for the EPA Pollutant Assessment Branch include a requirement that, to the extent possible, current and verified data be used in developing quantitative risk assessments or that an explanation be included in the assessment as to why those data are not being used.

Please advise us of the status of this operating manual, including an explanation as to how it is being developed, its costs, and when it will be completed.

Response to Question 5

It should be noted that EPA already has detailed process for quantitative risk assessment of hazardous air pollutants. The Agency published in the Federal Register in November 1984 proposed guidelines for carcinogen risk assessment and for exposure assessment. These proposed guidelines were favorably reviewed by the Agency's Science Advisory Board and will be published in final form shortly. The guidelines have been followed to the extent practicable since they were proposed. The operating manual is to consolidate existing Agency guidance, including more specific procedures currently used by the Air Office, into a single document for use by new employees and to ensure consistency. The manual will be prepared in-house and will require a minimal commitment of resources. We plan to have the manual completed by the end of FY 1986.

With respect to the recommendation that "current and verified data be used in developing quantitative risk assessments," it is important to recognize what the assessment will be used for and what the magnitude of risks are before seeking the "best" data available. For example, preliminary risk estimates might indicate that a pollutant causes one cancer case every 700 years. Even if more accurate data would change these risk estimates by plus or minus 100%, it would not affect the Agency's decision and it would make no sense to conduct source tests at substantial expense to "verify" the data. Also, it is much less important to have "current and verified" data for establishing early regulatory priorities than it is when the risk data are used to make final decisions on the stringency of a NESHAP. Clearly, the use of the risk data is the important consideration and the "best" (and generally most expensive to obtain) data are not needed for all uses.

Question 6

GAO notes EPA's decision that "certain benzene source categories . . . do not pose a significant risk to the public" and do not require Federal regulation. Please explain the basis for this decision. According to EPA, four of five States mentioned in the report have "no plans" to regulate these sources "because of inadequate resources," but could consider this "if EPA were to provide funding, personnel, and technical and scientific support." GAO adds:

> The state officials expressed some concern over EPA's withdrawal of the proposed standards. For example, one state official said that it would be difficult for the states to effectively enforce any state regulation for the withdrawn source categories because of EPA's determination that the benzene risks are not significant.

Should these sources be regulated from a health standpoint by the States if EPA finds that benzene risks are not significant"? Do the State laws mentioned allow such regulation where EPA makes such a finding? How do these laws and the State reluctance comport with section 101(3) of the Clean Air Act which includes a Congressional finding "that the prevention and control of air pollution at its source is the primary responsibility of States and local governments?" Does this finding apply to substances considered under section 112? What is the status and success of the acrylonitrile project? What is the likelihood of EPA providing funding and personnel support in light of Gramm-Rudman?

Response to Question 6

The basis for the decision is explained in the Federal Register notice announcing it (June 6, 1984, pp. 23558) and summarized well on pp. 23 and 24 of the GAO report. In summary, the excess cancers caused nationwide by three of the source categories EPA decided not to regulate ranged from 1 case every 25 years to 1 case every 100 years. The maximum lifetime individual risk for these source categories ranged from 4×10^{-5} to 1.7×10^{-4}. EPA concluded that the benzene health risks from the 3 source categories and the potential reductions in health risks achievable with available control techniques were too small to warrant Federal regulation under section 112.

We do not intend that an EPA decision against regulating a source category should preclude States from regulating such sources. As indicated in the Agency's Air Toxics Strategy, we intend to use Federal resources to regulate pollutants and source categories that cause significant risks to the public on a nationwide basis. For those pollutants/source categories that cause elevated risks in only a few localized areas, we generally intend to provide all our information to the State and local air agencies affected and work with them as they see fit to evaluate and, if necessary, regulate these sources on a case-by-case basis. Our experience with the acrylonitrile (AN) pilot project indicates that most State laws do not preclude the State from taking action if EPA decides not to regulate. Thus, there appears to be no inconsistency between State laws and the Congressional finding in section 101(3). We interpret section 101(3) as applying generally in the Clean Air Act as discussed in the attached December 20, 1985 letter to GAO (Attachment 1).

The AN pilot project is proceeding well. All States have agreed to participate; evaluations are completed for most of the AN sources, public hearings are underway and regulatory decisions for many of the sources are expected by early summer. Over 25% of the sources already have made commitments to reduce substantially their AN emissions.

Our current budget plans call for providing $7.5 million in FY86 and $11.5 million in FY87 in section 105 program grant funds for air toxics activities. Some reprogramming from lower priority activities will be needed to provide this level of funding. In addition, we plan to support State and local air toxics activities through a variety of in-house activities, including operation of the Air Toxics Clearinghouse; guidance on monitoring, modeling, emission inventories and control technology; providing State and local agencies with the results of all EPA's assessment on sources and risks; and other technical assistance upon request (limited, of course, by available resources).

Question 7

Please provide a table showing the States (and areas thereof) required to have ozone attainment by December 1982, indicate those granted extensions to 1987, the status of attainment, the measures (other than stage II controls) for attainment and their status, whether they require stage I controls, whether they committed to stage II controls, and whether they can reach attainment without stage I and II controls.

Response to Question 7

Table 1 lists the areas required to attain by December 31, 1982, as well as their attainment status as of July 1, 1985. As you know, EPA normally requires 3 years of monitoring data before redesignating an ozone nonattainment area to attainment. In addition, a period of up to 1 year is normally needed for processing monitoring data. This means that the full picture on December 31, 1982, attainment should be clear by the end of this year.

Table 2 lists the ozone extension areas. All of these areas remain as nonattainment areas.

A summary of EPA requirements for ozone nonattainment areas is shown in Table 3. Please note that Stage II controls are not an absolute requirement in any of these areas, although several areas have adopted and implemented them.

In addition, Table 4 gives a state-by-state summary of all volatile organic compound (VOC) regulations (Group I, Group II, Group III, other) as of late 1984. The specific status of Stage I controls can be found for each State in the "Service Stations--Stage I" line under Group I VOC regulations in Table 4.

A summary of Stage II vapor control commitments contained in 1982 ozone SIP's appears in Table 5. Ozone SIP's that demonstrate attainment without Stage I or Stage II vapor controls are shown in Table 6.

TABLE 1

NONATTAINMENT NONEXTENSION AREAS - OZONE

(These areas were due to attain by 1982. Extension areas are listed separately.)

State	Area (Counties)	Current Attainment Status (7/1/85)	
		Nonattainment	Attainment
AL	Etowah	x	
	Jefferson	x	
	Mobile	x	
	Russell	x	
AZ	Maricopa	x	
AR	Pulaski		x
CA	Butte	x	
	Imperial	x	
	Kern	x	
	Kings	x	
	Madera	x	
	Merced	x	
	San Bernardino	x	
	Sutter	x	
	Tulare	x	
	Yuba	x	
FL	Duval	x	
	Hillsborough	x	
	Orange	x	
	Pinellas	x	
GA	Clayton	x	
	Cobb	x	
	Coweta	x	
	Dekalb	x	
	Douglas	x	
	Fayette	x	
	Fulton	x	
	Gwinett	x	
	Henry	x	
	Muscogee	x	
	Paulding	x	
	Rockdale	x	

State	Area (Counties)	Current Attainment Status (7/1/85)	
		Nonattainment	Attainment
IL	Adams		x
	Boone		x
	Dekalb		x
	Grundy		x
	Kankakee		x
	Kendall		x
	LaSalle		x
	Peoria		x
	Sangamon		x
	Tazewell		x
	Williamson	x	
IN	Allen		x
	Elkhart	x	
	Marion	x	
	St. Joseph	x	
KS	Douglas	x	
	Johnson	x	
	Wyandotte	x	
KY	Boyd	x	
	Fayette		x
LA	Ascension	x	
	Beauregard	x	
	Bossier	x	
	Caddo	x	
	Calcasieu	x	
	E. Baton Rouge	x	
	Grant	x	
	Iberville	x	
	Jefferson	x	
	Lafayette	x	
	Lafourche	x	
	Orleans	x	
	Pointe Coupee	x	
	St. Bernard	x	
	St. Charles	x	
	St. James	x	
	St. John the Baptist	x	
	St. Mary	x	
	W. Baton Rouge	x	

State	Area (Counties)	Current Attainment Status (7/1/85)	
		Nonattainment	Attainment
ME	Androscoggin	x	
	Cumberland	x	
	Franklin	x	
	Kennebec	x	
	Knox	x	
	Lincoln	x	
	Oxford	x	
	Sagadahoc	x	
	Somerset	x	
	Waldo	x	
	York	x	
MI	Allegan	x	
	Barry	x	
	Bay	x	
	Berrien	x	
	Branch	x	
	Calhoun	x	
	Cass	x	
	Clinton	x	
	Eaton	x	
	Genesee	x	
	Gratiot	x	
	Hillsdale	x	
	Huron	x	
	Ingham	x	
	Ionia	x	
	Jackson	x	
	Kalamazoo	x	
	Kent	x	
	Lapeer	x	
	Lenawee	x	
	Livingston	x	
	Marquette	x	
	Midland	x	
	Monroe	x	
	Montcalm	x	
	Muskegon	x	
	Ottawa	x	
	Saginaw	x	
	St. Clair	x	
	St. Joseph	x	
	Sanilac	x	
	Shiawassee	x	
	Tuscola	x	
	Van Buren	x	
	Washtenaw	x	

State	Area (Counties)	Current Attainment Status (7/1/85)	
		Nonattainment	Attainment
MO	Clay	x	
	Jackson	x	
	Platte	x	
NV	Clark	x	
NH	Belknap	x	
	Cheshire	x	
	Hillsborough	x	
	Merrimack	x	
	Rockingham	x	
	Strafford	x	
	Sullivan	x	
NY	Albany		x
	Cayuga		x
	Columbia		x
	Dutchess		x
	Erie		x
	Genesee		x
	Greene		x
	Linvingston		x
	Monroe		x
	Niagara		x
	Onondaga		x
	Ontario		x
	Orange		x
	Orleans		x
	Putnam		x
	Rensselaer		x
	Saratoga		x
	Schenectady	x	
	Seneca		x
	Ulster		x
	Wayne		x
	Wyoming		x
	Yates		x
NC	Mecklenberg	x	

State	Area (Counties)	Current Attainment Status (7/1/85)	
		Nonattainment	Attainment
OH	Allen		x
	Ashland		x
	Ashtabula	x	
	Belmont		x
	Brown		x
	Carroll		x
	Champaign		x
	Clark	x	
	Clinton	x	
	Columbiana	x	
	Darke		x
	Delaware	x	
	Erie		x
	Fairfield		x
	Fayette		x
	Franklin	x	
	Fulton		x
	Geauga	x	
	Greene	x	
	Hancock		x
	Harrison		x
	Henry		x
	Highland		x
	Hocking		x
	Holmes		x
	Huron		x
	Jefferson	x	
	Knox		x
	Lawrence		x
	Licking	x	
	Logan		x
	Lucas	x	
	Madison		x
	Mahoning	x	
	Marion		x
	Miami	x	
	Montgomery	x	
	Morrow		x
	Ottawa		x
	Perry		x
	Pickaway		x
	Portage	x	
	Preble	x	
	Richland		x
	Ross		x
	Sandusky		x

State	Area (Counties)	Current Attainment Status (7/1/85)	
		Nonattainment	Attainment
OH	Seneca		x
	Shelby		x
	Stark	x	
	Summit	x	
	Trumbull	x	
	Tuscarawas		x
	Union		x
	Wayne		x
	Wood		x
OK	Oklahoma		x
	Tulsa	x	
OR	Jackson	x	
	Marion	x	
	Polk	x	
PA	Adams	x	
	Bedford	x	
	Berks	x	
	Blair	x	
	Bradford		x
	Cambria	x	
	Cameron		x
	Carbon	x	
	Centre	x	
	Clarion		x
	Clearfield	x	
	Clinton		x
	Columbia		x
	Crawford	x	
	Cumberland	x	
	Dauphin	x	
	Elk		x
	Erie	x	
	Fayette	x	
	Forest		x
	Franklin	x	
	Fulton		x
	Greene	x	
	Huntingdon		x
	Indiana	x	
	Jefferson		x
	Juniata	x	
	Lackawanna	x	
	Lancaster	x	

State	Area (Counties)	Current Attainment Status (7/1/85)	
		Nonattainment	Attainment
PA	Lawrence	x	
	Lebanon	x	
	Luzerne	x	
	Lycoming	x	
	McKean		x
	Mercer	x	
	Mifflin		x
	Monroe	x	
	Montour		x
	Northumberland	x	
	Perry	x	
	Pike	x	
	Potter		x
	Schuylkill	x	
	Snyder	x	
	Somerset	x	
	Sullivan		x
	Susquehanna	x	
	Tioga		x
	Union		x
	Venango		x
	Warren	x	
	Wayne	x	
	Wyoming	x	
	York	x	
SC	Berkeley		x
	Charleston		x
	Lexington		x
	Richland		x
	York	x	
TN	Bradley	x	
	Davidson	x	
	Hamilton	x	
	Knox		x
	Maury		x
	Roane	x	
	Rutherford	x	
	Shelby	x	
	Sullivan		x
	Sumner	x	
	Williamson	x	
	Wilson	x	

State	Area Counties)	Current Attainment Status (7/1/85)	
		Nonattainment	Attainment
TX	razoria	x	
	allas	x	
	Paso	x	
	lveston	x	
	egg	x	
	Jefferson	x	
	Nueces	x	
	Orange	x	
	Tarrant	x	
	Victoria	x	
VA	Chesterfield	x	
	Fairfax	x	
	Henrico	x	
	Roanoke		x
	Stafford		x
	Alexandria (city)	x	
	Chesapeake (city)		x
	Falls Church (city)	x	
	Hampton (city)		x
	Manassas (city)	x	
	Manassas Park (city)	x	
	Newport News (city)		x
	Norfolk (city)		x
	Portsmouth (city)		x
	Richmond (city)	x	
	Roanoke (city)		x
	Salem (city)		x
	Suffolk (city)		x
	Virginia Beach (city)		x
WI	Brown		x
	Columbia		x
	Dane		x
	Sheboygan	x	
	Vilas		x

TABLE 2

OZONE EXTENSION AREAS

1. Connecticut
2. Springfield, MA
3. Worcester, MA
4. Boston, MA-NH
5. New York City, NY-NJ-CT
6. Washington, DC
7. Baltimore, MD
8. Allentown, Bethlehem, Easton, PA
9. Pittsburgh, PA
10. Philadlephia, PA-NJ-DE
11. Louisville, KY-IN
12. Cincinnati, OH-KY
13. Cleveland, OH
14. Detroit, MI
15. Milwaukee, WI
16. Chicago, IL-IN-WI
17. Houston, TX
18. St. Louis, MO-IL
19. Salt Lake City, UT
20. Denver, CO
21. Portland, OR
22. Seattle, WA
23. Fresno, CA
24. Sacramento, CA
25. San Diego, CA
26. San Francisco Bay Area, CA
27. Los Angeles (South Coast), CA
28. Oxnard-Ventura, CA
29. Santa Barbara, CA
30. Stockton, CA
31. Monterey-Santa Cruz, CA

TABLE 3

Summary of EPA Requirements for Ozone Nonattainment Areas

Areas	Group I*	Group II*	Group III*	Other Sources >100 TPY	Additional Measures
Urbanized ozone nonattainment non-extension areas not presently subject to a SIP call	X (>100 TPY)	X (>100 TPY)	-	-	-
Rural nonattainment	X (>100 TPY)	X (>100 TPY)	-	-	-
Urbanized areas requesting extensions beyond 1982	X	X	X	X	X[1]
1984 & 1985 SIP call areas	X	X	X	X	X[1]
Urbanized ozone[2] extension areas not likely to attain by 1987--long-term ozone problem areas	X	X	X	X	X
States classified as attainment areas for ozone					

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*Groups I, II, and III refer to the VOC source categories listed in Table 4.

[1] If necessary to attain by 1987.

[2] EPA is in the process of determining those additional measures that may be required of such areas.

TABLE 4

STATE SUMMARY OF VOC REGULATIONS
CTG GROUPS I, II
REGIONS I-V

KEY
○ NO REGULATIONS
◐ NO REGULATIONS/NO SOURCES IN NONATTAINMENT AREA
■ NO REGULATIONS; SOURCES ARE <100 TPY
● EPA APPROVED REGULATION
☆ REGULATION NOT CONSISTENT WITH CTG
◉ APPROVAL PENDING
□ UNDER DEVELOPMENT

VOC REGULATIONS	CONNECTICUT	MAINE	MASSACHUSETTS	NEW HAMPSHIRE	RHODE ISLAND	VERMONT	NEW JERSEY	NEW YORK	NEW YORK METRO	DELAWARE	DISTRICT OF COLUMBIA	MARYLAND	PENNSYLVANIA	VIRGINIA	WEST VIRGINIA	ALABAMA	FLORIDA	GEORGIA	KENTUCKY	MISSISSIPPI	NORTH CAROLINA	SOUTH CAROLINA	TENNESSEE	ILLINOIS	INDIANA	MICHIGAN	MINNESOTA	OHIO	WISCONSIN
	I						II			III						IV								V					
ATTAINMENT DATE	87	82	87	82	82	–	87	82	87	87	87	87	82 87	82 87	–	82	82	82	82 87	–	82	82	82	82 87	82 87	82 87	–	82 87	82 87
GROUP I																													
· SURFACE COATING																													
—CANS	●	◐	●	●	◐	○	●	●	●	◐	◐	●	●	●	○	●	●	●	●	○	●	●	●	●	●	●	○	●	●
—COILS	●	◐	●	◐	◐	○	●	●	●	●	◐	●	●	●	○	●	●	●	●	○	●	●	●	●	●	●	○	●	●
—PAPER	●	●	●	●	●	○	●	●	●	●	◐	●	●	●	○	●	●	●	●	○	●	●	●	●	●	●	○	●	●
—FABRICS	●	◐	●	●	●	○	●	●	●	●	◐	●	●	●	○	●	●	●	●	○	●	●	●	●	□	●	○	●	●
—AUTOS/LIGHT-DUTY TRUCKS	◐	◐	●	◐	◐	○	●	●	●	●	◐	●	●	●	○	●	◐	●	●	○	●	◐	●	●	●	●	○	●	●
—METAL FURNITURE	●	◐	●	●	◐	○	●	●	●	●	◐	●	●	●	○	●	●	●	●	○	●	●	●	●	●	●	○	●	●
—MAGNET WIRE	●	◐	●	●	◐	○	●	●	●	◐	◐	◐	●	●	○	●	●	●	●	○	●	●	●	●	●	●	○	●	●
—LARGE APPLIANCES	◐	◐	●	◐	◐	○	●	●	●	●	◐	●	●	●	○	●	●	●	●	○	●	●	●	●	●	●	○	●	●
· PETROLEUM LIQUIDS IN FIXED-ROOF TANKS	●	●	●	●	●	○	●	●	●	●	●	●	●	●	○	●	●	●	●	○	●	●	●	●	●	●	○	●	●
· BULK TERMINALS	●	●	●	●	●	○	●	●	●	●	●	●	●	●	○	●	●	●	●	○	●	●	●	●	●	●	○	●	●
· BULK PLANTS	●	■	●	■	●	○	●	●	●	●	●	●	●	●	○	●	●	■	●	○	●	●	●	●	●	●	○	●	●
· SERVICE STATIONS—STAGE 1	●	■	●	■	●	○	●	■	●	●	●	●	●	●	○	●	●	■	●	○	●	■	●	●	●	●	○	●	●
· PETROLEUM REFINERIES (MISCELLANEOUS SOURCES)	◐	◐	◐	●	◐	○	●	●	●	●	◐	◐	●	●	○	●	●	●	●	○	●	■	●	●	●	●	○	●	●
· CUTBACK ASPHALT	●	■	●	●	■	○	●	●	●	●	●	●	●	●	○	●	●	●	●	○	●	●	●	●	●	●	○	●	●
· SOLVENT METAL CLEANING (DEGREASERS)	●	■	●	●	●	○	●	●	●	●	●	●	●	●	○	●	●	●	●	○	●	●	●	●	●	●	○	●	●
GROUP II																													
· PETROLEUM REFINERY—LEAKS	◐	◐	◐	○	◐	○	●	●	●	●	◐	●	●	●	○	●	◐	●	●	○	◐	■	●	●	●	●	○	●	●
· SURFACE COATING—MISCELLANEOUS METAL PARTS	●	■	●	●	○	○	●	●	●	●	◐	●	●	●	○	●	●	●	●	○	●	●	●	●	●	●	○	●	●
· SURFACE COATING—FLATWOOD PANELING	◐	■	◐	■	◐	○	●	●	●	◐	◐	◐	◐	●	○	●	●	●	●	○	●	●	●	◐	●	●	○	◐	●
· PHARMACEUTICAL MANUFACTURE	●	■	◐	■	○	○	●	●	●	●	◐	●	●	●	○	●	◐	●	●	○	◐	●	●	○	●	●	○	●	●
· RUBBER TIRE MANUFACTURE	☆	■	◐	■	◐	○	◐	☆	◐	◐	◐	◐	●	●	○	●	◐	●	●	○	●	●	●	☆	●	●	○	●	●
· GRAPHIC ARTS	●	■	●	●	●	○	●	●	●	●	◐	●	●	●	○	●	●	●	●	○	●	●	●	☆	●	●	○	●	●
· PETROLEUM LIQUIDS IN FLOATING ROOF TANKS	☆	■	●	■	●	○	●	□	□	●	◐	●	◐	●	○	●	●	●	●	○	◐	●	●	☆	●	●	○	●	●
· DRYCLEANING—PERCHLOROETHYLENE	●	■	●	■	○	○	■	☆	☆	●	◐	●	●	●	○	●	●	■	●	○	●	■	●	●	☆	●	○	●	◐
· GASOLINE TANK TRUCKS	☆	■	☆	■	○	○	●	□	□	●	●	●	●	●	○	●	●	■	●	○	●	■	●	○	●	●	○	●	●

STATE SUMMARY OF VOC REGULATIONS
CTG GROUPS I, II
REGIONS VI-X

KEY
○ NO REGULATIONS
◐ NO REGULATIONS; NO SOURCES IN NONATTAINMENT AREA
■ NO REGULATIONS; SOURCES ARE ≤100 TPY
● EPA APPROVED REGULATION
▲ REGULATION NOT CONSISTENT WITH CTG
◑ APPROVAL PENDING
□ UNDER DEVELOPMENT

	VI					VII					VIII						IX						X			
ATTAINMENT DATE	82	82	82	82	87	–	82	82	87	–	87	–	–	–	82 83	–	82	87	87	87	–	82	–	–	82 87	87
VOC REGULATIONS	ARKANSAS	LOUISIANA	NEW MEXICO	OKLAHOMA	TEXAS	IOWA	KANSAS	MISSOURI (KC)	MISSOURI (ST. L)	NEBRASKA	COLORADO	MONTANA	NORTH DAKOTA	SOUTH DAKOTA	UTAH	WYOMING	ARIZONA	CALIFORNIA—BAY AREA	CALIFORNIA—SAN DIEGO	CALIFORNIA—SOUTH COAST	HAWAII	NEVADA	ALASKA	IDAHO	OREGON	WASHINGTON
GROUP I																										
• SURFACE COATING																										
—CANS	■	●	■	◐	●	○	■	●	●	○	●	○	○	○	◐	○	●	●	●	●	○	◐	○	○	●	●
—COILS	■	●	■	◐	●	○	■	●	●	○	●	○	○	○	◐	○	●	●	●	●	○	◐	○	○	●	●
—PAPER	■	●	■	◐	●	○	■	●	●	○	●	○	○	○	●	○	■	●	●	●	○	◐	○	○	●	●
—FABRICS	■	●	■	◐	●	○	■	●	●	○	●	○	○	○	●	○	■	●	●	●	○	◐	○	○	●	●
—AUTOS/LIGHT-DUTY TRUCKS	■	●	■	◐	●	○	●	●	●	○	●	○	○	○	◐	○	■	●	○	●	○	◐	○	○	●	●
—METAL FURNITURE	■	●	■	◐	●	○	■	●	●	○	●	○	○	○	●	○	●	●	●	●	○	◐	○	○	●	●
—MAGNET WIRE	■	●	■	◐	◐	○	■	●	●	○	●	○	○	○	●	○	■	●	◐	●	○	◐	○	○	●	●
—LARGE APPLIANCES	■	●	■	◐	●	○	■	●	●	○	●	○	○	○	●	○	●	○	●	●	○	●	○	○	●	●
• PETROLEUM LIQUIDS IN FIXED-ROOF TANKS	●	●	●	●	●	○	●	●	●	○	●	○	○	○	●	○	●	●	●	●	○	●	○	○	●	●
• BULK TERMINALS	●	●	●	●	●	○	●	●	●	○	●	○	○	○	●	○	■	●	●	●	○	●	○	○	●	●
• BULK PLANTS	●	●	◐	●	●	○	■	●	●	○	●	○	○	○	●	○	■	●	●	●	○	●	○	○	●	●
• SERVICE STATIONS—STAGE 1	●	●	●	●	●	○	■	●	●	○	●	○	○	○	●	○	■	●	●	●	○	●	○	○	●	●
• PETROLEUM REFINERIES (MISCELLANEOUS SOURCES)	■	●	●	●	●	○	●	●	◐	○	●	○	○	○	●	○	■	●	●	●	○	◐	○	○	●	●
• CUTBACK ASPHALT	●	●	●	●	●	○	●	●	●	○	●	○	○	○	●	○	●	●	●	●	○	●	○	○	●	●
• SOLVENT METAL CLEANING (DEGREASERS)	■	●	■	●	●	○	■	●	●	○	●	○	○	○	●	○	●	●	●	●	○	●	○	○	●	●
GROUP II																										
• PETROLEUM REFINERY—LEAKS	◐	●	◐	●	●	○	●	●	◐	○	●	○	○	○	●	○	◐	●	◐	●	○	◐	○	○	●	●
• SURFACE COATING—MISCELLANEOUS METAL PARTS	●	●	◐	●	●	○	○	●	●	○	●	○	○	○	●	○	●	●	●	●	○	○	○	□	●	●
• SURFACE COATING—FLATWOOD PANELING	◐	●	◐	■	●	○	○	○	○	○	◐	○	○	○	●	○	○	●	○	●	○	○	○	○	●	●
• PHARMACEUTICAL MANUFACTURE	◐	●	◐	◐	●	○	○	○	●	○	●	○	○	○	●	○	○	●	○	●	○	○	○	○	◐	■
• RUBBER TIRE MANUFACTURE	◐	◐	◐	●	◐	○	○	○	○	○	◐	○	○	○	◐	○	○	●	○	○	○	○	○	○	◐	■
• GRAPHIC ARTS	◐	●	◐	●	●	○	○	●	●	○	●	○	○	○	●	○	○	●	○	●	○	○	○	○	●	●
• PETROLEUM LIQUIDS IN FLOATING ROOF TANKS	●	●	◐	●	●	○	●	●	●	○	●	○	○	○	●	○	○	●	●	●	○	○	○	○	●	●
• DRYCLEANING—PERCHLOROETHYLENE	◐	●	◐	■	●	○	○	●	●	○	●	○	○	○	●	○	●	●	●	●	○	○	○	○	●	●
• GASOLINE TANK TRUCKS	●	●	◐	●	●	○	●	●	●	○	●	○	○	○	●	○	○	●	●	●	○	●	○	○	●	●

STATE SUMMARY OF VOC REGULATIONS
CTG GROUPS III AND OTHER RELATED REGULATIONS
REGIONS I-V

KEY
- ◐ NO REGULATIONS
- ◒ NO REGULATIONS; NO SOURCES IN NONATTAINMENT AREA
- ■ NO REGULATIONS; SOURCES ARE <100 TPY
- ○ EPA APPROVED REGULATION
- ● REGULATION NOT CONSISTENT WITH CTG
- ⬟ APPROVAL PENDING
- □ UNDER DEVELOPMENT

	I						II			III						IV								V					
VOC REGULATIONS	CONNECTICUT	MAINE	MASSACHUSETTS	NEW HAMPSHIRE	RHODE ISLAND	VERMONT	NEW JERSEY	NEW YORK	NEW YORK METRO	DELAWARE	DISTRICT OF COLUMBIA	MARYLAND	PENNSYLVANIA	VIRGINIA	WEST VIRGINIA	ALABAMA	FLORIDA	GEORGIA	KENTUCKY	MISSISSIPPI	NORTH CAROLINA	SOUTH CAROLINA	TENNESSEE	ILLINOIS	INDIANA	MICHIGAN	MINNESOTA	OHIO	WISCONSIN
GROUP III																													
• LARGE PETROLEUM DRYCLEANERS	◐	◐	◐	◐	◐	○	□	◐	◐	◐	●	◐	○	◐	○	○	○	○	○	○	○	○	○	○	○	◐	○	◐	●
• MANUFACTURE OF HIGH DENSITY POLYETHYLENE, POLYPROPYLENE, POLYSTYRENE RESINS	◐	◐	◐	◐	◐	○	□	◐	◐	◐	◐	◐	■	◐	○	○	○	○	○	○	○	○	○	○	○	○	○	◐	○
• NATURAL GAS/GAS PROCESSING PLANTS	◐	◐	◐	◐	◐	○	□	○	○	◐	◐	◐	○	○	○	○	○	○	○	○	○	○	○	◐	○	○	○	◐	○
• SOCMI FUGITIVE EMISSIONS	◐	◐	◐	◐	◐	○	□	○	○	◐	◐	◐	○	○	○	○	○	○	○	○	○	○	○	✩	○	○	○	◐	○
• VOLATIVE STORAGE VESSELS							□						CTGs NOT ISSUED YET																
• SOCMI—AIR OXIDATION	◐	◐	◐	◐	◐	○	□	○	○	◐	◐	◐	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◐	○
OTHER																													
• RACT (CASE BY CASE)	○	○	●	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	●	●	○	○	○
• ARCHITECTURAL COATINGS	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○
• ETHYLENE PRODUCTION PLANT	○	○	○	○	○	○	○	○	○	○	●	○	●	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○
• SMALL FIXED-ROOF TANK	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
• WASTE GAS DISPOSAL	●	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○
• SURFACE COATING HEAVY OFF-HIGHWAY VEHICLE PRODUCTION	○	◐	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	⬟	○	○	○	○	○
• SURFACE COATING PLASTIC FILM	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
• GENERAL REG. FOR STORAGE, TRANSFER, DISPOSAL OF VOCs	●	○	○	○	○	○	●	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
• STORAGE OF HIGHLY VOLATILE ORGANIC COMPOUNDS	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
• BUBBLES	●	○	⬟	○	●	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
• STAGE II CONTROLS	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
• POLYETHYLENE BAG SEALING OPERATIONS	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
• DOCK LOADING FACILITIES	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
• AIRPLANE REFUELING	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
• SURFACE COATING—AEROSPACE	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○
• ASPHALTIC PITCH—ROOF COATING	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
• PUMPS AND COMPRESSORS	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○
• WATER SEPARATION	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
• ORGANIC SOLVENTS	●	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○
• SOLVENTS DISPOSAL	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

STATE SUMMARY OF VOC REGULATIONS
CTG GROUP III AND OTHER RELATED REGULATIONS
REGIONS VI-X

KEY
- ○ NO REGULATIONS
- ◐ NO REGULATIONS/NO SOURCES IN NONATTAINMENT AREA
- ■ NO REGULATIONS: SOURCES ARE <100 TPY
- ● EPA APPROVED REGULATION
- ◆ REGULATION NOT CONSISTENT WITH CTG
- ◉ APPROVAL PENDING
- □ UNDER DEVELOPMENT

	VI					VII					VIII						IX						X			
VOC REGULATIONS	ARKANSAS	LOUISIANA	NEW MEXICO	OKLAHOMA	TEXAS	IOWA	KANSAS	MISSOURI (KC)	MISSOURI (St. L)	NEBRASKA	COLORADO	MONTANA	NORTH DAKOTA	SOUTH DAKOTA	UTAH	WYOMING	ARIZONA	CALIFORNIA—BAY AREA	CALIFORNIA—SAN DIEGO	CALIFORNIA—SOUTH COAST	HAWAII	NEVADA	ALASKA	IDAHO	OREGON	WASHINGTON
GROUP III																										
• LARGE PETROLEUM DRYCLEANERS	■	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●	●	●	○	○	○	○	■	■
• MANUFACTURE OF HIGH DENSITY POLYETHYLENE, POLYPROPYLENE, POLYSTYRENE RESINS	■	○	○	○	○	○	○	◐	◐	○	○	○	○	○	○	○	○	●	○	●	○	○	○	○	◐	◐
• NATURAL GAS/GAS PROCESSING PLANTS	○	○	○	○	○	○	○	◐	◐	○	○	○	○	○	○	○	○	□	□	□	○	○	○	○	◐	◐
• SOCMI FUGITIVE EMISSIONS	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◐	○
• VOLATIVE STORAGE VESSELS													CTGs NOT ISSUED YET													
• SOCMI—AIR OXIDATION	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	◐	○
OTHER																										
• RACT (CASE BY CASE)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
• ARCHITECTURAL COATINGS	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	●	●	●	●	○	○	○	○	○	○
• ETHYLENE PRODUCTION PLANT	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
• SMALL FIXED ROOF TANK	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	○	○
• WASTE GAS DISPOSAL	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○
• SURFACE COATING HEAVY OFF-HIGHWAY VEHICLE PRODUCTION	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	●	○	○	○	○	○	○
• SURFACE COATING PLASTIC FILM	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	●	○	●	○	○	○	○	○	○
• GENERAL REQ. FOR STORAGE, TRANSFER, DISPOSAL OF VOCs	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○
• STORAGE OF HIGHLY VOLATILE ORGANIC COMPOUNDS	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	●	●	●	○	○	○	○	○	○
• BUBBLES	○	○	○	○	○	○	○	◆	◆	○	●	○	○	○	○	○	○	●	●	●	○	○	○	○	●	○
• STAGE II CONTROLS	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●	●	○	●	○	○	○	○
• POLYETHYLENE BAG SEALING OPERATIONS	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
• DOCK LOADING FACILITIES	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	■	○
• AIRPLANE REFUELING	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○
• SURFACE COATING—AEROSPACE	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	○	○
• ASPHALTIC PITCH—ROOF COATING	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○
• PUMPS AND COMPRESSORS	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○
• SEMICONDUCTOR MANUFACTURE	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○						
• SURFACE COATING—PLASTIC PARTS	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	●	○	○	○	○	○	○
• SURFACE COATING—WOOD FURNITURE	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	●	○	○	○	○	○	○
• VALVES/FLANGES AT CHEMICAL PLANTS	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○
• COATINGS AND INK	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○	○	●	○	●	○	○	○			

TABLE 5

Summary of Stage II Vapor Control Commitments in 1982 Ozone SIP's

State	SIP Commitment
Illinois*	Contingency measure only.
Indiana*	Contingency measure only.
Maryland Metro Washington	SIP includes "schedule for consideration of Stage II vapor recovery" as a contingency measure in the event that alternative measures necessary for attainment cannot be identified.
Baltimore	Evaluate Stage II as regulatory alternative and, if selected, develop and promulgate regulations.
New Jersey	Review and evaluation of Stage II leading to adoption of regulations during 1986.
New York	Deferring adoption and implementation of Stage II controls pending decision by EPA regarding on board control technology.
Virginia	State will evaluate and review progress and advances in Stage II vapor recovery and alternative measures.
Pennsylvania (Phila)	State to consider a combination of measures which may include Stage II, Group III CTG's and other measures will be used to make up any reduction.
California	Adopted regulation.
District of Columbia	Adopted regulation.

*Information reported is based upon draft SIP submittals

TABLE 6

State Ozone SIP that Demonstrate Attainment Without Stage I or Stage II Vapor Controls

Maine

New Hampshire

Vermont

New York (upstate)

West Virginia

Mississippi

South Carolina

Minnesota

Iowa

Nebraska

Montana

North Dakota

South Dakota

Wyoming

Hawaii

Alaska

Idaho

Question 8

The GAO report states that Illinois prohibits implementation of stage II controls "until EPA determines that such controls are required for compliance with the Clean Air Act" after "petroleum interests ... lobbied strongly for this law." To what extent is Illinois in compliance with the law and regulations (including its State implementation plan) concerning ozone? What is the status of that plan? Does the Act require EPA to make such a determination before a State implements such controls to meet attainment deadlines? Is there any requirement under the Clean Air Act that stage II controls be "imposed nation-wide," even though such controls may be "politically unpopular" in the States where needed for attainment and "politically difficult to implement" and given the congressional finding cited above regarding the State role under the law? What is EPA doing to enforce any requirement under State Implementation Plans (SIPs) for such controls?

Response to Question 8

Illinois' 1979 plan was unable to provide for attainment by the end of 1982 and, thus, an extension was granted until 1987. The State was then required to submit an additional plan providing for attainment by the end of 1987. This second plan is late. EPA has returned recent State submittals because they lack some of the stationary source reasonably available control technology (RACT) regulations that are necessary for EPA approval of the plan. The most recent State submittal shows that, if the Illinois Pollution Control Board adopts all the required RACT rules soon, Stage II will not be necessary for Illinois to have an approvable plan.

The Clean Air Act does not require EPA to determine that specific non-RACT measures are needed to attain. To have an approvable State implementation plan (SIP), EPA requires that Illinois adopt all stationary source RACT measures [control technology guideline (CTG) Groups I, II, III, and non-CTG on major sources], plus an automobile inspection and maintenance (I/M) program, along with sufficient additional measures needed to demonstrate attainment. A State is free to choose these additional measures. Several States listed in Table 5 have chosen Stage II as an additional measure and have committed to its implementation by the end of 1987. The Act does not require that Stage II controls be imposed nationwide. Although Stage II is one of several measures that States may appropriately choose to adopt if additional emission reductions are necessary, Stage II has not been defined by EPA as a nationwide RACT measure.

With regard to enforcement of Stage II vapor recovery controls, the Agency does not envision any new or special program to enforce Stage II (or other additional attainment measures) other than the standard actions EPA traditionally employs to enforce other volatile organic compound (VOC) control measures. With regard to health, any measures that provide for attainment of the primary ozone national ambient air quality standard (health based) would have beneficial health consequences.

Question 9

The GAO report states:

> EPA officials agree with state officials that a vapor-recovery decision is likely to be met with public opposition. Because they would be responsible for implementation costs, oil and gas interests oppose stage II controls, and the automobile manufacturers oppose onboard regulations. The Director of EPA's Office of Policy Analysis (responsible for studying vapor recovery after the 1977 amendments) told us that because of the political opposition associated with vapor recovery controls, the States want EPA to impose controls on them.
>
> The Executive Secretary of the State and Territorial Air Pollution Program Administrators explained that stage II controls are politically difficult for states to implement, especially without EPA guidance. He stated that state air pollution control officials need EPA to issue a control technique guideline document or some other document mandating stage II controls for nonattainment areas. Such a federal mandate would provide the state air pollution officials with a stronger mechanism to obtain action from their respective governors and State legislatures.
>
> * * * *
>
> When EPA took no action, the same organization passed another vapor control resolution in June 1985. The Administrators resolved that EPA should (1) specify stage II vapor recovery as reasonably available control technology for all ozone nonattainment areas which need stage II to meet the 1987 deadline, (2) establish a national summertime limit on gasoline volatility, and (3) require onboard evaporative control technology. (Underlining supplied)

(a) Please explain why EPA needs to "specify" stage II recovery as "RACT" for ozone nonattainment areas. Is there any doubt what those controls are? What is the effect of such specification by EPA? Is stage II required for ozone attainment areas? Is it needed for health reasons?

(b) Can EPA establish a summertime volatility limit for January 1, 1987? Is that needed for ozone attainment areas? Is it needed for health reasons?

(c) Can item number (3) be required by model year 1989 as urged by STAPPA? Is it required for ozone nonattainment? Is it required in ozone attainment areas? Is it needed for health reasons?

(d) GAO refers to enforcement regarding stage II and indicates that EPA considers it a problem and costly, while on-board controls do not present this problem or cost. Please explain this problem and cost, who bears this cost, and why that should tilt EPA toward on-board controls which puts the cost on manufacturers and ultimately on the consumer.

(e) While such action may be desirable from STAPPA's view, it would appear that EPA and STAPPA are confusing the issue by, in effect, shifting the burden from the States to EPA of deciding what controls are needed to achieve ozone attainment by December 1987. As we understand the Act, the States must be in attainment by the end of 1987. How that is achieved is the State's responsibility, subject to EPA approval of State SIPs. Instead of making that clear to the States, EPA appears to confuse the issue and by allowing some States to now claim that they are waiting for an EPA "mandate." (We note that, to their credit, California and the District of Columbia acted without such a mandate.) But if that mandate never comes or does not come in time for attainment purposes, the States are not excused under the law from the deadline requirements regarding ozone attainment. Do you agree? (We are also asking by this letter that GAO address these questions as to the State's obligations and the need for mandate.) What is EPA doing to so inform the States and enforce the law? Part of this confusion may presumably stem from EPA's failure to make and publish its determination and cost comparision under section 202(a)(6). When will EPA comply with the law in this regard?

(f) Is the "mandate" merely a determination that "stage II" is "RACT"? Is there a challenge in the States because of a lack of such a determination? Is it needed under the law?

Response to Question 9

(a) EPA does not believe that it has to issue Stage II guidance for States to include the program in an ozone plan as a locally needed, reasonably available measure. In the past, States have desired a Federal RACT CTG for nationwide consistency and for administrative ease. EPA believes that Stage II technology is one of a number of measures available for use by States needing help in attaining the ozone standard.

With respect to the question of Stage II in attainment areas, under present Agency ozone policy, it is not required. Stage II has been identified in several States (the Table 5 list) as necessary for attainment even though EPA has not issued a CTG on this control measure.

(b) EPA just recently (February 4 and 5) held a public hearing to receive comments on its extensive technical analysis of gasoline volatility and the effect on hydrocarbon emissions (Attachment 2). Given that a proposed rule has yet to be issued, a fuel volatility standard for January 1, 1987 or even the summer of 1987 does not appear feasible, even if deemed appropriate. Volatility standards beginning in the 1988-90 timeframe may be feasible, depending on the timing of the decision and the stringency of the standards.

The current evaporative emissions excess can be reduced either through commercial Reid vapor pressure (RVP) controls or vehicle modifications; both approaches have the potential for significant hydrocarbon (HC) reductions. Because commercial fuel control has an immediate impact on the entire vehicle fleet (unlike strategies that affect only new vehicle design), greater short-term emission reductions are achievable via this strategy. (The environmental impact of various fuel- and vehicle-oriented control strategies is examined in more detail in Chapter 5 of Attachment 2).

Obviously, reducing HC emissions will improve ozone levels and, as a result, reduce adverse health effects. In addition, as also outlined in this technical study, volatility controls for commercial gasoline appear to cause a small reduction in benzene emissions. However, this finding is based on very limited data and is currently the subject of further analysis. In any event, such an effect is expected to be small and not the major focus of such regulation.

(c) In order for an onboard requirement to be effective for the 1989 model year, a final rule would probably be needed by this fall. This implementation schedule would provide manufacturers with 24 months of leadtime. Since a decision has not yet been made, such a rulemaking schedule is unlikely. Therefore, the earliest an onboard requirement would likely be effective would be the 1990 model year.

At this point, neither onboard controls nor Stage II controls can be in place in time to assist in meeting the 1987 ozone goals for non-attainment areas. Nevertheless, it is clear that onboard controls would provide substantial reductions in refueling emissions nationwide, especially in the long run. In the post-1987 timeframe, these reductions could assist compliance in the many non-attainment areas which are unlikely to meet the ozone standard by 1987 and would also help to assist in offsetting the effects of growth in attainment areas. In addition, nationwide onboard controls would reduce emissions of hazardous substances which are part of the gasoline vapor (e.g., benzene), thus leading to reductions in any adverse health effects arising from exposure to these pollutants. Thus, onboard refueling controls could be valuable from both an ozone and a health effects perspective.

(d) Stage II in-use efficiency, as described in the GAO report, is highly dependent on the degree of State and local enforcement effort. In our analysis, we estimate the range on stage II collection efficiency to be from 62 percent to 86 percent. The lower end corresponds to minimal enforcement, while the upper value assumes all stations are inspected once per year. (We also looked at semi-annual and quarterly inspection frequencies; annual inspections turned out to be the most cost-effective choice). Costs were developed based on information obtained from State and local agency experience.

The onboard system is a modification of current canister systems on motor vehicles. Inspection procedures and resources are expected to be little different than those now in use. Some additional resources could be required to cover anti-tampering inspections relative to onboard systems, but these resources are quite small compared to the annual enforcement requirement for Stage II.

Any additional inspection costs for onboard would ultimately be borne by the taxpayer. The costs for stage II enforcement would be borne by the taxpayer if no inspection fees are assessed by the State or local agency, or by the consumer as a pass-through if such fees are assessed.

(e) The Act specifies both 1982 and 1987 deadlines. Part D of the Act also requires the implementation of all reasonably available controls, and EPA has facilitated national consistency on these controls through the issuance of CTG's on RACT measures. All post-1982 nonattainment areas must implement all of the CTG RACT measures as a basic requirement. The additional measures (including Stage II) are required for EPA approval of a State's attainment demonstration where attainment cannot be demonstrated without these or other comparable measures.

EPA agrees that States are not excused under the Act if they fail to meet the deadline requirements. EPA believes that existing guidance is sufficiently clear on informing States of their obligations under the Act.

EPA disagrees with the implication in this question that it has not complied with section 202(a)(6) of the Act. Section 202(a)(6) requires only that the Administrator "determine the feasibility and desirability" of onboard controls, after comparing the cost and effectiveness of such controls to other vapor recovery systems, and that he require onboard controls if he finds them "feasible and desirable." The Administrator made and published a preliminary determination April 13, 1981 based on data available at that time. See NRDC v. EPA, No. 83-C-2011, Slip Op. at 2 (D.D.C., Oct. 15, 1983). 46 Fed. Reg. 21628, 21629 col. 2. His determination at that time was not to require onboard controls. The law did not require the Administrator to publish detailed findings such as a "cost comparison" as suggested in the question. EPA is now reconsidering the 1981 determination based on new information (e.g., the health effects of gas vapors). We have published extensive analysis of the feasibility and desirability of onboard controls. 49 Fed. Reg. 31706 (August 8, 1984); "Evaluation of Air Pollution Regulatory Strategies for Gasoline Marketing Industries," EPA-450/3-84-012a. As indicated previously, we expect to announce a decision on this issue this spring.

(f) Again, EPA believes existing guidance is clear in requiring States to identify and adopt additional measures such as Stage II where needed to attain. If a Stage II vapor recovery program is necessary for attainment of the ozone standard, EPA believes that sufficient technical information exists for States to develop and implement such a program. EPA has no obligation under the Act to issue a CTG for Stage II.

Question 10

GAO states that as of October 1985, EPA believed that "stage II standards could be issued no sooner than November 1986" and they could not be "fully installed for another 6 years." Please explain why it is necessary to issue "standards" and why it will take so long if they apply only to nonattainment areas.

Response to Question 10

There seems to be some confusion in the GAO report concerning Stage II implementation. The quote comes from page 47 of the report dealing with ozone nonattainment areas. The EPA standards are not required for the States to implement Stage II control for ozone purposes, although some sort of guidance probably would be helpful. Federal standards would be required, however, if national control were specified pursuant to section 112. It could take until late 1986 to issue guidance for ozone implementation purposes, especially if a technical guidance document were involved.

The time period cited for full implementation (six years) is one of a range of possible outcomes. Our estimate is that it would take from three to seven years for full implementation (from date of issuance of State regulations), depending on the degree of difficulty involved (e.g., public resistance, etc.).

Question 11

GAO states that EPA is "examining the health effects of gasoline vapor ... and the ramifications" thereof on vapor recovery. The report refers to a 1984 report of the American Petroleum Institute (API) which EPA evaluated and, in a staff paper, concluded that unleaded gasoline should be classified as a probable carcinogen. GAO then said that in September 1985 the Health Effects Institute published a review of the scientific uncertainties surrounding gasoline vapor carcinogenicity and concluded that possible carcinogenicity of gasoline vapor to humans "cannot be dismissed but it is not possible to draw accurate conclusions concerning the degree of human risk."

What is the status of EPA's gasoline vapor report? Does EPA plan to consider gasoline vapor as a 112 substance? Please provide a summary of the health data regarding gasoline refueling vapors and explain why EPA believes nationwide controls may be warranted. Is this health problem due to benzene?

Response to Question 11

In June 1984, EPA prepared a staff paper on the "Estimation of the Public Health Risks from Exposure to Gasoline Via the Gasoline Marketing System" that was submitted for review to EPA's Science Advisory Board (SAB). The staff paper documented cancer risk estimates for total gasoline vapor exposure based on results of renal tumors in male rats and liver tumors in female mice observed in a chronic inhalation study of wholly vaporized unleaded gasoline sponsored by the American Petroleum Institute. The SAB concluded that "the committee believes that the (API) study was well designed,".... and that ... "wholly vaporized unleaded gasoline vapors should be classified as probably carcinogenic to humans." The SAB commented that additional analysis of the available epidemiological literature on distribution workers exposed to gasoline vapors could be useful since some studies have identified small excess rates of kidney cancer, liver, and digestive tract cancers to workers exposed a long period of time.

While the SAB agreed with the weight-of-evidence of human carcinogenesis, there was considerable debate at the meeting regarding the representativeness of inhaled vapors of the animal study in comparison to gasoline vapors people may inhale. Specifically, the vapors subject to human inhalation probably contain more volatile and lower molecular weight compounds than the completely vaporized sample administered to the test animals. Certain short term toxicity studies sponsored by API and the Air Force have shown that the branched-chain alkanes and alkenes in the C-6 to C-9 range are associated with male rat nephropathy, and that the nephrotoxic response is not seen in female rats, dogs or monkeys. As a group, these branched-chain hydrocarbons are of lower volatility than the other lower molecular weight hydrocarbons, and therefore may be found in the vapor at lower concentration than what the animals inhaled in the API study. The EPA has evaluated these various short-term studies to determine if there is a possible link between nephrotoxicity and kidney cancer in male rats. Thus far no morphological association has been demonstrated and, therefore, EPA has no plans at present to alter the conclusion on the carcinogenicity of gasoline vapors. The EPA currently expects to issue a final staff paper by May 31, 1986.

The EPA's risk analysis of the gasoline marketing system focused on four atmospheric pollutants emitted from the system: benzene, gasoline vapors, ethylene dibromide (EDB) and ethylene dichloride (EDC). The analysis indicated that the incidence and maximum individual lifetime risk associated with EDB and EDC appeared negligible, and would further decrease with time since these constituents are only found in leaded gasoline. Consequently, the present focus is limited to benzene and gasoline vapors as the pollutants of concern.

The risks due to benzene exposure and gasoline vapor exposure are being assessed separately, since the type of cancer caused by benzene (leukemia) and the tumors caused by gas vapors (kidney and liver tumors) are different.

The EPA is currently evaluating the health risks associated with population exposure to both benzene and gas vapor emissions from the gasoline distribution system. If EPA determines that the gasoline distribution system causes nationally significant health risks, Federal regulatory controls, including action under section 112, will be considered.

Question 12

GAO indicates that stage II technology "has improved in recent years" with use and that the "number of customer complaints . . . has decreased over time." In the case of the on-board system, GAO said that EPA believes that a prototype on-board system, tested in 1978, "would be capable of 92 percent in-use control efficiency, and would function for the average lifetime of a passenger vehicle." More recently, EPA developed a different prototype that EPA believes will have a "95 percent in-use control efficiency." However, the report states:

> The California Air Resources Board believes that EPA's estimate of onboard system control efficiency may be overly optimistic, given that the system has not yet been demonstrated on an in-use vehicle fleet. CARB also noted that evaporative emissions canisters have not succeeded in controlling all of the evaporative emissions, which may be due to flaws in the system. Thus, EPA's assumptions that onboard systems will be effective because they are an extension of evaporative emissions systems does not seem appropriate, according to CARB. The engineering project manager at EPA's Office of Mobile Sources acknowledged that evaporative canisters do not always meet performance standards when tested on in-use vehicles. He stated that this occurs because of the increased volatility of in-use fuel relative to the volatility of fuel used to design and test the canisters. (Underlining supplied)

(a) Is CARB right? Have both these systems been fully demonstrated? Are motor vehicle firms required to use these systems under the Act? Are they safe? What is the durability of both systems?

(b) Please explain to what extent gasoline volatility affects evaporative, exhaust HC, refueling, stage I, and bulk storage and distribution emissions.

(c) Are evaporative control systems designed by auto manufacturers to meet hydrocarbon (HC) standards based on a vehicle fueled with a certification test gasoline which has a Reid Vapor Pressure (RVP) of 9.0 psi? Is it true that this level of volatility was developed by EPA in the early 1970's, but the RVP has increased due to the rising energy costs? When did EPA first discover this change in RVP? What is the effect of this higher volatility on approved control systems and emissions?

(d) According to a portion of a September 1985 document of the Office of Mobile Sources (MS) entitled "Gasoline Volatility and Evaporative Hydrocarbon Control," a "Presentation to the Administrator" OMS said:

Control Approaches

-- The long-term solution to the excess evaporative emission problem is to equate in-use and certification fuel RVPs.

-- This can be done at any RVP between 9 psi, that of the current test fuel, and 11.5 psi, that of future commercial fuel.

-- Equating the RVPs of the two fuels at 11.5 psi focuses all control on vehicle redesign.

-- Equating the RVPs of the two fuels between 9.0 psi focuses all control on fuel modification.

-- Equating the RVPs of the two fuels between 9.0 and 11.5 psi focuses part of control on the vehicle and part of control on the fuel.

-- In-use volatility controls can be implemented quicker than vehicle controls, due the latter's need for the fleet to turnover. This raises the possibility that in-use volatility controls could be implemented in the short term and relaxed in the long term if vehicle control keyed to the long-term in-use RVP are also implemented in the short term.

Please provide the full text of this document, explain its purpose, and state when this presentation was made, the result thereof, and the participants. Please provide a copy of all letters, memoranda, notes, and other documents in EPA files, including OSM and Ann Arbor, from January 1, 1984 to the present. What is the legal basis for such controls? What are the pros and cons of these control approaches? That document also states that the "basic problem is that butane costing 50 cents per gallon can essentially be sold for 90 cents per gallon by adding it to gasoline." Is that true? What does butane do for octane and fuel economy? What are the volatility impacts and concerns where there are alcohol or other blends?

(e) What is the Evaporative Index and what does it have to do with emissions? Please explain its relationship to a so-called "DuPont Waiver" and explain that waiver and its status? What did EPA require in that waiver and why? What is the relationship of these matters to Oxygenated Fuels Association" seeking? What is that Association seeking?

(f) The November 8, 1985 edition of Inside E.P.A. states that EPA "has resolved internal staff differences over a draft technical report of its Ann Arbor" office "that supports the regulation of gasoline volatility levels to reduce ozone emissions." What were those differences and how were they resolved? The article states that the revisions "have not changed EPA staff opinion that volatility controls are a more cost effective way to control ozone than a Stage II, at the pump system." Is that true? Please explain the basis for these views. The article then states:

> EPA sources say a conference is planned on the volatility issue to give EPA Administrator Lee Thomas a "handle" on public opinion about the viability of volatility controls as part of the agency's decision on how to regulate gasoline marketing. EPA reportedly is leaning toward a move to control potentially toxic gas vapors through nationwide use of on-board automobile canisters, and is contemplating volatility controls to reduce ozone formation from auto emissions. Stage II devices could control both gas vapors and ozone, EPA sources explain, but reportedly not as cost-effectively. Nor could Stage II be implemented as quickly as volatility controls, sources say; therefore, volatility controls would be better able to ease state's troubles in meeting the 1987 air act ozone attainment standard.
>
> Sources say EPA's office of air quality planning and standards intends to push Thomas to make a decision on the gasoline marketing question shortly after the volatility conference. OAQPS is reportedly loathe to postpone a decision on the larger issue of gasoline marketing controls until after a decision can be made on volatility, despite the need to be certain of a volatility level for test fuel used in certifying the adequacy of automobile pollution controls.

Please explain the purpose of the conference and the relationship of the volatility question and its resolution to Stage II and on-board controls. Please explain the basis, if any, for EPA resolving the on-board control versus stage II control before the volatility issue is resolved. What is the proper volatility level and why for test fuel?

(g) We are concerned about the fuel for engines problem in general from the standpoint of the interrelated concerns of fuel economy, emissions, vehicle performance, emission control device performance, including existing canisters, and other matters, including lead phasedown, and about the ability and vigilance of EPA in dealing with this important fuel issue, particularly under section 211 of the Clean Air Act. We are concerned about the extent to which the refiners and others in the oil industry may be taking actions, possibly inconsistent with section 211, that could adversely affect efforts of automakers and EPA to improve fuel economy and control emissions (while ensuring vehicle performance) and guaranteeing the effectiveness of control devices. An article in the January 27, 1986 edition of Automotive News (p. 19) calls attention to auto firms' effort to get oil companies to provide satisfactory fuel for engines with port fuel injection." We are also concerned about the need for any auto firm to issue the enclosed "Customer Information" and the effectiveness of such a notice because of fuel-related problems that these firms cannot control. Please identify (with the cooperation of the Administrator of the National Highway Traffic Safety Administration) all these fuel problems, explain their impacts on fuel economy, emissions, etc., and indicate what EPA is doing about them.

Response to Question 12

(a) The California Air Resources Board (CARB) is only partially correct in their assertion that onboard systems have not been evaluated on in-use vehicles. The first prototype approach using a "mechanical seal" in the fillpipe was evaluated on a number of different passenger cars, including two vehicles which both accumulated over 50,000 miles while retaining a refueling control efficiency of over 98 percent. The more recent approach, which employs a "liquid seal" in the fillpipe instead of a mechanical seal, has been evaluated on several recent model year passenger cars but has not been evaluated extensively in use. However, the long-term efficiency of the liquid seal approach in use should be at least as good if not better than the mechanical seal, since the liquid seal will not deteriorate and is tamper resistant. The other hardware components (e.g., carbon canister) are the same as those used on the earlier mechanical seal prototype.

CARB also asserts that concerns about the in use performance of current evaporative control systems call into question the effectiveness of similar components in the onboard system. The major problem affecting the in-use performance of current evaporative control systems is that they are not designed to adequately handle the level of emissions associated with today's high-volatility commercial fuels. (The answer to question 12(c) provides more information on this topic.) Other problems such as tampering have been fully considered in EPA's estimate for the in use efficiency of onboard controls.

Therefore, EPA believes that CARB's concerns about the potential in-use performance of onboard systems are overstated. While onboard control systems have not been evaluated extensively in use, engineering evaluation of the emission control hardware used and the available in use test information both indicate that well-maintained onboard control systems should maintain high in use efficiencies. The mechanical seal approach has been evaluated more extensively in use than the liquid seal approach, but the durability information from the vehicle using the mechanical seal is equally applicable to the liquid seal approach since the liquid seal is even less susceptible to in-use deterioration and tampering than the mechanical seal.

At present, there is no requirement to use onboard control systems. If EPA promulgates a final rule requiring onboard control of refueling losses, the Act levies no requirement on what type of hardware auto manufacturers must use. The only requirements would be that the system used provide the required reduction in refueling emissions while not increasing safety risks.

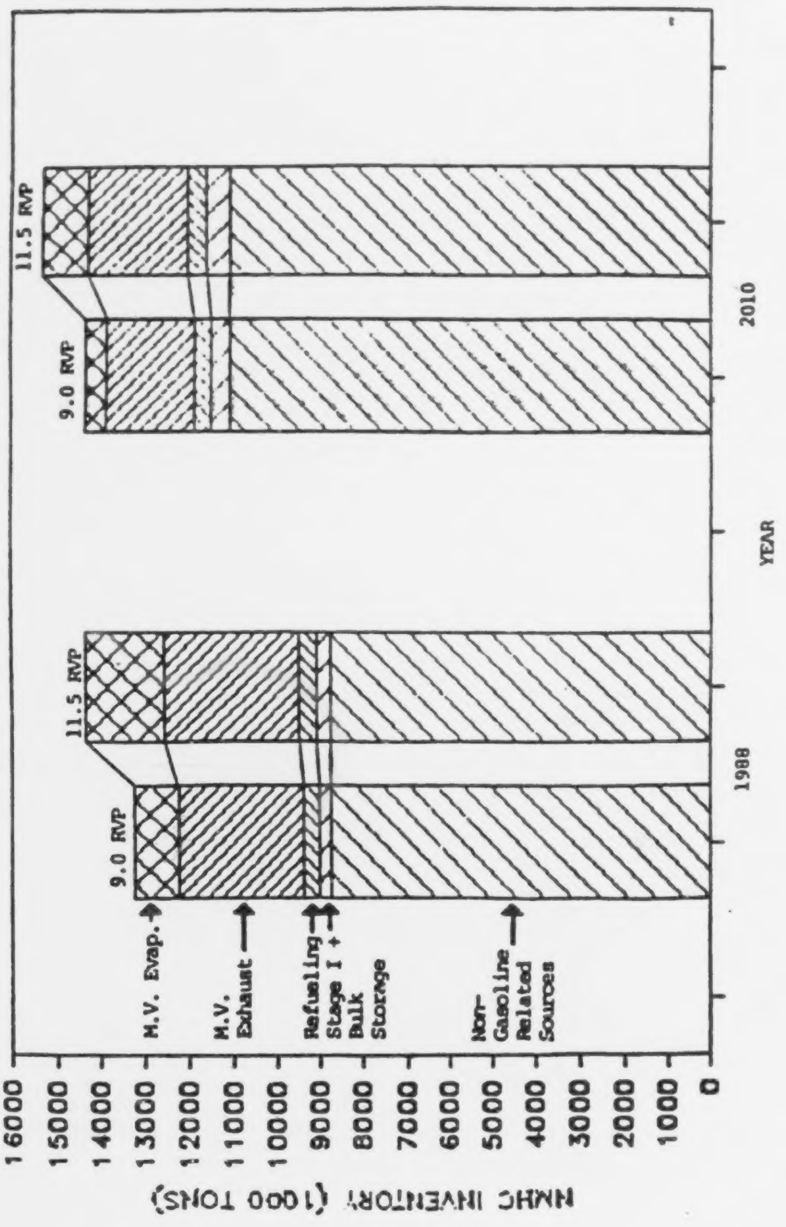
Potential safety concerns with onboard control systems lie in the areas of fuel spitback and vehicle rollover protection. The fillpipe seal should not increase any fuel spitback or spillage which occurs during a refueling event, and vehicles equipped with onboard hardware must still pass the Federal Motor Vehicle Safety Standards (FMVSS) for vehicle rollover protection. While the mechanical seal approach may require some type of pressure relief device to address any potential problems with fuel spitback, the liquid seal approach has no such problems. In fact, one of the major incentives behind EPA's development of the liquid seal approach was to address this fuel spitback concern. Compliance with the FMVSS for vehicle rollover protection would require installation of a larger rollover valve than presently used, since the vapor line emerging from the top of the fuel tank would be larger with an onboard refueling system than that now used with evaporative control systems. Several different rollover valve designs have already been suggested by auto manufacturers, and application of these designs to current passenger car fuel tanks is not complex. Thus, EPA believes that design of safe onboard control systems is relatively straightforward.

(b) Please see Figure 1. These bar charts show total non-methane hydrocarbon (NMHC) emissions for the nation excluding California (where volatility is already controlled to 9 psi in the summer). Two years depict the short and long terms, 1988 and 2010, respectively. The inventories are broken down into the emission categories you mentioned, plus the non-gasoline related category (which does not change with RVP). The bar charts show the impact of rising commercial volatility on gasoline-related sources. The column labeled "9.0 RVP" designates commercial fuel volatility control to the level of EPA's current test fuel; "11.5 RVP" represents the volatility of commercial fuel in Class C areas (assumed to rise to ASTM's limit of 11.5 psi by the late 1980's). Both columns assume certification fuel RVP stays at its current level -- 9.0 psi. Of course, it is also possible to increase the volatility of certification fuel, which is another alternative EPA is considering.

As shown in Figure 1, commercial RVP remaining at 11.5 psi into the future will result in over 1 million tons of NMHC in excess of the 9.0 RVP case. This represents a 7-8.5 percent increase in the total NMHC inventory and a 25-31 percent rise in emissions from gasoline-related sources alone. Of these total increases, the major contributing source is evaporative HC from motor vehicles, representing 61-71 percent of the total increase. Motor vehicle exhaust HC emissions (15-21 percent), refueling losses (8 percent), and Stage I and bulk storage/distribution emissions (6-10 percent) make up the remainder of the total increase in tons between the 9.0 and 11.5 RVP scenarios.

Figure 1

Impact Of RVP Trends On Emissions (Non-California)



(c) EPA's current emission test fuel has a nominal RVP of 9.0 psi. Thus, auto manufacturers are only required to design their evaporative control systems to meet the certification standard while the vehicle is fueled with this 9.0 RVP test fuel. Nationwide average RVP of commercial gasoline in the summer was roughly 9 psi as late as 1971. It has gradually increased since, due to rising butane content, with sizeable jumps of 0.5 psi in 1973-74 and 1982. Such survey data are generally available within about a year after sampling. EPA's early testing of in-use 1981 vehicles certified to the new 2-gram/test standard for evaporative HC indicated sufficient design capacity for the then-current RVP. No further testing was performed until mid-1984 when the current problem was discovered. Basically, high RVP fuels produce levels of evaporative emissions that may overwhelm the capacity of the charcoal canister and the engine's ability to purge the canister. The excess vapors then pass right through the fully loaded canister and are emitted into the atmosphere. This situation can be corrected by lowering the volatility of commercial fuel or by requiring the systems to be certified to an RVP more typical of commercial fuels.

(d) A list of written material being provided relevant to the issue of gasoline volatility (Attachment 3), including the text of the briefing given to the Administrator on gasoline volatility (Attachment 4), is enclosed. Also enclosed are lists of items in the dockets for both the fuel volatility study (Attachment 5) and the DuPont waiver (Attachment 6). We presume you already have these documents. If you don't, please let us know which items you need and we will provide them.

The Administrator's briefing was given on October 8, 1985 and its purpose was to present the results of the volatility study prior to its release. All major offices within EPA were represented and the result of the briefing was a decision to publish the volatility study.

EPA's primary legal basis for controlling gasoline volatility is Section 211(c) of the Clean Air Act. The pros and cons of such control are outlined in detail in both the briefing document and technical document. However, the basic trade-off between vehicle and fuel control appears to be that the former is more cost effective but slow in its effect on in-use emissions, while the latter is quickly effective but more costly per ton of hydrocarbon controlled. (Cost effectiveness of the various strategies is reviewed in Chapter 6 of the technical study enclosed.) Fuel control also appears to provide roughly 70 percent more emission control than vehicle redesign. (Environmental impact is reviewed in Chapter 5 and emission reductions achievable via the various control strategies are also summarized in Chapter 6 of the study.)

It is true that the driving force behind rising fuel volatility is economics -- refiners pay roughly 50 cents per gallon of butane versus 90 cents per gallon of gasoline. Consequently, refiners have gradually increased the butane content of their gasolines, which has resulted in an increase in fuel volatility (RVP); this, in turn, apparently has led to excess evaporative HC emissions being released to the atmosphere. Because of the economic incentives and because new vehicle technology (i.e., fuel injection) is more tolerant of high-RVP fuels, we expect butane content and, thus, RVP to continue to rise in the future.

Butane, besides its low price per volume, also increases octane (roughly 0.055 octane number (R+M/2) per volume percent in unleaded regular, less in higher octane fuel). However, because of its low energy content, the addition of butane decreases fuel economy (roughly 0.2 percent per volume percent). (The economic and performance aspects of butane addition and removal are discussed in Chapter 4 of the technical study on fuel volatility.)

Alcohols are currently the only additives which significantly affect fuel volatility. Two basic approaches can be taken in the addition of alcohols to gasoline: 1) the alcohol can be "splash-blended" into a high-RVP gasoline that was not specially prepared; or 2) alcohols can be added to a speciallyblended gasoline that is lower in RVP to counterbalance the effect of alcohol addition on volatility. The splash-blending of alcohols in gasoline significantly increases RVP and, thus, evaporative emissions. However, the use of specially-blended low-RVP gasolines to produce alcohol blends offsets the volatility increase caused by alcohol addition and tends to result in no significant increase in evaporative emissions. (The effects of alcohol blends on volatility and evaporative emissions are reviewed in Chapter 2, Section IV, of the technical study enclosed.) Today's ethanol blends (i.e., gasohol) are splash-blended and generally have an RVP higher than alcohol-free gasolines. Recent in-use fuel surveys confirm this, with ethanol blends averaging 12.5 psi RVP in Class C areas. Today's methanol blends, on the other hand, are specially blended so they should not typically have an RVP much greater than that of alcohol-free gasoline.

(e) In addition to the discussion below, we would like to refer you to the enclosed documents, which are primarily alcohol-related. Also, the DuPont waiver docket (Attachment 6) contains additional items that may interest you.

The Evaporative Index (EI) is one specific index or measure which expresses the tendency of a gasoline sample to evaporate. It was developed from an equation DuPont originally derived from a statistical analysis correlating other, more conventional, fuel volatility parameters to vehicle evaporative emissions. The EI is a weighted sum of three of these other parameters, as follows:

EI = 0.85 RVP + 0.14 (% 200 °F) - 0.32 (%100 °F)
where RVP = Reid Vapor Pressure of the blend
% 200 °F = % of fuel evaporated at 200 °F and
% 100 °F = % of fuel evaporated at 100 °F.

It is known from numerous vehicle tests run by EPA and other investigators that vehicle evaporative emissions increase as RVP increases. It has also been theorized and observed that vehicle evaporative emissions increase when the points on a distillation curve (such as the 100°, 160°, or 200°

point) shift towards higher volatility even when RVP is the same. The weighting factors in the above equation in theory reflect the relative effects of a change in RVP versus changes in the distillation curve. The EI is designed as a measure of fuel volatility (both RVP and distillation curve) that correlates with vehicle evaporative emissions.

In 1984, DuPont applied for a Section 211(f) waiver for use of 5 percent methanol and 2.5 percent cosolvent alcohols (ethyl, propyl, and/or butyl alcohols) in unleaded gasoline, subject only to ASTM volatility restrictions. To refute arguments in circulation at the time that alcohol per se had an effect on evaporative emissions apart from any changes it caused in conventional volatility parameters, DuPont empirically derived the Evaporative Index and claimed that when differences in EI were considered, alcohol per se could not be said to have a statistically significant effect on evaporative emissions.

Addition of alcohol to gasoline increases both the fuel RVP and points on the distillation curve unless steps are taken to lower fuel volatility. DuPont did argue that there was an upper limit to how volatile a 5%/2.5% blend would be in commercial practice, due to industry standards, scattered state standards, and market satisfaction requirements. However, EPA believed that this upper limit was quite high compared to the large majority of alcohol-free gasolines and did not appear at the time to EPA that 5%/2.5% blends would on average be no different in volatility and evaporative emissions than the gasoline they would displace. Thus, EPA stated in its waiver decision for the DuPont waiver application that the request as submitted was not acceptable.

Since EPA believed that it was necessary to assure that the average volatility of the blend would not be greater than the volatility of the average gasoline that the blend would displace in the market place, EPA decided to go beyond DuPont's narrow request and to approve the waiver application subject to more stringent volatility restrictions. This equality of average volatility would have to apply for a volatility measure or index which fully reflected the evaporative emissions effect of both RVP and the shape of the distillation curve, since large changes in both could result from blending with methanol. Equality of average RVP or use of any one point from the distillation curve could not be relied upon to suffice. DuPont had developed a measure claimed to have this ability, namely the Evaporative Index, and EPA had no reason to believe another measure would be better. Therefore, EPA reasoned that the average EI of methanol blends should be equal to that of the gasoline they would displace.

EPA presumed that the gasoline that would be displaced would be a cross section of present gasolines. It being impossible to directly regulate the average of a spectrum of blend products sold by many blenders, EPA had to select a single upper limit for EI that would influence the average in the desired way. EPA calculated the 60th percentile of the EI for in-use fuels meeting the ASTM standards for 1983 according to survey data available from the Motor Vehicle Manufacturers Association (MVMA). The difference between the 60th percentile and the true mean was judged by EPA to be what would result in practice as blenders came close to, but never exceeded, the EI limits. EPA then approved the DuPont waiver subject to this limit.

The Oxygenated Fuels Association (OFA), which represents companies with interests in the production or marketing of methanol blend fuel, filed a court suit challenging the conditions of the waiver decision issued by EPA in January 1985 and petitioned EPA to reconsider that decision. OFA would like to have the EI condition removed from the waiver since OFA feels that the EI condition lowers volatility to the extent that use of the DuPont waiver is no longer economically feasible. OFA also feels that the technical limitations associated with the derivation of the EI make it inappropriate for regulatory use for fuel specifications. OFA also commented that waivers granted earlier by EPA did not have such strict volatility controls and that such controls unfairly penalize OFA member companies. OFA also argues that EPA rulemaking on fuel volatility issues under Section 211(c) is the appropriate mechanism to address the issue of increases in fuel volatility in general for both gasoline and gasoline-alcohol blends. OFA also claims that its calculations show that total vehicle hydrocarbon emissions, including exhaust and evaporative emissions, decrease with use of blends even with a slight increase in evaporative emissions.

Although EPA believes the original DuPont waiver decision was correct based on the record existing at that time, EPA has agreed to reconsider and reopen the waiver for public comment, primarily because of recently obtained data on the rising RVP of commercial gasoline, and is preparing a Federal Register notice for that purpose.

(f) Since EPA is unaware of the source of the information mentioned by Inside EPA, there is no way to determine what internal staff differences were being referred to. As in the review of any major study, there are questions and comments made by all the reviewing offices. Memoranda containing such comments were included in our response to question 12(d). All such questions or comments were resolved prior to publication.

The quote attributed to EPA staff concerning the relative cost effectiveness of volatility controls and Stage II controls is wrong. As noted in the enclosed technical report, the cost-effectiveness of volatility controls varies with the degree of control. Similarly, Stage II cost-effectiveness varies with assumptions on exemption levels, level of maintenance and enforcement, and extent of geographic coverage. A blanket statement that one is always more cost-effective than the other is misleading and inappropriate.

It is not clear what conference the article was describing. It could have been the public hearing which was held on the volatility study on February 4 and 5 in Ann Arbor. While the main focus of the hearing was gasoline volatility and motor vehicle evaporative emissions, onboard and Stage II refueling loss controls were mentioned from time to time. As reviewed in the technical study enclosed, commercial fuel volatility does have a small impact on the level of uncontrolled refueling losses; therefore, the potential benefits used in cost effectiveness calculations for onboard or Stage II controls are somewhat dependent upon the commercial fuel RVP assumed in the analyses.

With regard to the pervasive ozone nonattainment problems, it is becoming clear that a range of measures will be needed to make meaningful progress. Candidate measures include controls on vehicle refueling and fuel volatility. In this context, they are linked. Moreover, if onboard were the method designated for refueling control, the in-use volatility of fuel would have to be established at the time of promulgation of an onboard requirement, since onboard design parameters depend in part on fuel volatility. There is less of a direct tie between Stage II and volatility controls, since changes in volatility have no effect on Stage II design.

EPA has not determined the proper volatility levels for either in-use or test fuel. Generally speaking, the two should be matched, but at what level is still under evaluation. Written comments on EPA's volatility study are not due until March 27, and substantial analysis will still be required before a decision can be made.

(g) EPA is aware of two aspects of gasoline which have significant environmental effects: lead content and volatility. EPA is actively addressing these two issues, as you are aware.

EPA continually monitors the effects of various fuel parameters on emissions and emission control system components. For example, two gasoline constituents that have been found (through testing) to be essentially vehicle performance-related and not emission-related are octane number and detergent additives (addressed in the Automotive News article you cited). If further testing should reveal that these or other fuel properties have an effect on emissions, we will address them as necessary.

Referring to the last portion of your question, EPA has identified those fuel parameters that affect regulated emissions. The primary uncertainty still present is with respect to unregulated emissions, particularly those which are potentially carcinogenic. EPA is in the process of implementing the test protocols called for in Section 211(b)(2) of the Clean Air Act, which will provide much more information concerning the effect of various fuel components and additives on human health.

EPA has also recently taken into account the effect of various test fuel parameters on official fuel economy measurements. This should improve the consistency of reported results. Commercial fuel variation can affect in-use fuel economy, but the overall variation is small (e.g., 1-2 percent). Thus, no real problem appears to exist in this area.

Question 13

The GAO report states that:

-- EPA "has not presented most of its cost-effectiveness estimates for vehicle-refueling control options with ranges to reflect the underlying uncertainty;"

-- There are several "uncertainties" affecting cost estimates that "were not presented as ranges" by EPA; they "include the cost of alternative technologies, control system performance and durability, and the length of implementation schedules for both options;"

-- Unless EPA presents these uncertainties, "the differences between competing alternatives may be exaggerated;"

-- "EPA's selective presentation of uncertainty in its automobile refueling analysis may create misleading impressions;"

-- EPA presented its "Options Paper" in draft form in July 1985 in a manner that showed "control efficiency of onboard systems as "certain," giving the "impression that more is known" about this prototype technology "than about" stage II technology which is in "use at thousands of service stations;"

-- GAO questions EPA's cost-effectiveness analysis in comparing ozone reductions in attainment and nonattainment areas; and

-- EPA "did not estimate the impact of a stage II regulation for non-attainment areas only because it did not have information on local market conditions."

GAO recommends:

> To improve EPA's cost-effectiveness analysis used to help determine the best alternative for controlling automobile refueling vapor emissions, we recommend that the Administrator, Environmental Protection Agency, direct that a range of values be provided to reflect the various uncertainties inherent in its cost-effectiveness analysis.

What will EPA do to implement this recommendation and when will this be done? We also request that EPA respond to the GAO conclusions and comments at the end of this chapter.

Response to Question 13

The EPA has already considered uncertainty in some areas in its latest analysis (e.g., significance of gas vapor health effects, efficiency and implementation time for Stage II, difference in value of VOC reductions in ozone nonattainment versus attainment areas). Moreover, we are investigating the sensitivity of Stage II and onboard costs and onboard efficiency. In short, we will evaluate ranges of values where such analysis can provide greater insight and contribute to a sound decision.

Attachment 7

STATUS REPORT ON SUBSTANCES UNDER CONSIDERATION FOR LISTING AND/OR REGULATION

Acetaldehyde

Acetaldehyde is used to make other organic chemicals, and it is also produced during combustion and in the photochemical reaction process. A Health Summary was completed in early 1985. There is some evidence of cancer in workers and animals; it is also a strong respiratory irritant. A draft Health Assessment Document (HAD) is scheduled for completion in late summer 1986. A decision on the need for Science Advisory Board review will be made after the draft HAD is completed. A regulatory decision is scheduled in 1987.

Acrolein

Acrolein is used to make other organic chemicals, and it is also produced during combustion and in the photochemical reaction process. A Health Summary was completed in early 1985. Acrolein is mutagenic in some test systems and is a strong respiratory irritant. A HAD is underway; the first draft will be completed in late summer 1986. A decision on the need for Science Advisory Board review will be made after the draft HAD is completed. A regulatory decision is scheduled in 1987.

Acrylonitrile

Evaluation is complete; classified by EPA according to the criteria of the International Agency for Research on Cancer as a probable human carcinogen. Public health risks from cancer are limited to a few industrial facilities. The EPA is conducting a pilot program with State or local agencies where acrylonitrile (AN) sources are located (27 sources in 15 States) whereby the State and local agencies are evaluating and, if necessary, regulating the sources with EPA providing technical and scientific support. A Federal Register announcement of the program was published on June 10, 1985. This approach will provide control of AN sources more quickly and more cost effectively than section 112 standards. All State AN facilities have been subjected to an engineering inspection. The majority of the States are moving rapidly into the regulatory decision phase of the project. The projection is that approximately half of the facilities (involving 6-7 States) will add significant controls to that which existed before the initiation of the pilot study; many already have begun programs to reduce emissions.

Arsenic

Arsenic was listed as a hazardous pollutant under section 112 in June 1980 based on the risk of lung cancer. Regulations on copper smelters and glass plants were proposed in July 1983. The public comment period was reopened in late 1983 to solicit comments on EPA's analysis of technical data submitted to the Agency by affected industries. In addition, the largest arsenic source announced its intention to close. The EPA is developing a final rulemaking package.

Asbestos

Asbestos was listed as a hazardous pollutant under section 112 in 1971 based on the risk of lung cancer and mesothelioma. Regulations on several source categories were promulgated in 1973. Risks could not be estimated owing to the lack of a unit risk number. However, a revised health document

SAB in mid-1984. Studies are underway to determine if any additional regulatory actions are necessary.

Benzene

Benzene was listed as a hazardous pollutant under section 112 in June 1977 based on the risk of leukemia. Regulations on four source categories in the chemical and petroleum refining industry were proposed in 1980 and 1981. In June 1984, EPA promulgated regulations for benzene fugitive emissions, proposed regulations for coke oven by-product recovery plants, and withdrew three earlier proposals on maleic anhydride manufacture, ethylbenzene/styrene manufacture and benzene storage. In August 1984, an analysis of regulatory strategies for reducing the public health risks due to benzene and gasoline vapors from gasoline marketing was published for public comment. Analysis is underway. A decision on the appropriate regulatory strategy is expected in spring 1986. We also expect to promulgate the regulations for coke oven by-product recovery plants by the end of 1986.

Beryllium

Beryllium was listed as a hazardous pollutant under section 112 in 1971 because of berylliosis (a type of lung disease). Regulations were promulgated to achieve a safe ambient air exposure level of 0.01 $\mu g/m^3$. Beryllium is under reassessment because of new evidence of possible carcinogenicity. Further review of emission sources was initiated in late 1984 to determine whether additional source control is possible. The carcinogenicity potential is being re-evaluated; an updated Health Assessment Document was released for public comment in January 1985. The SAB reviewed the document in June. It is currently scheduled for a second SAB review in summer 1986.

Butadiene

The Mutagenicity and Carcinogenicity Assessment Document completed SAB review in April 1985. Their comments were incorporated and the document issued in final form in September. 1,3-Butadiene is classified as a probable human carcinogen. A Federal Register notice announcing EPA's Intent to List butadiene under section 112 was published on October 10, 1985 (50 FR 41466). Studies to develop National Emission Standards for Hazardous Air Pollutants (NESHAP) are currently underway.

Cadmium

The Health Assessment Document completed SAB review in December 1984. Non-carcinogenic adverse health effects can occur, but not at concentrations either expected or measured in the ambient air. Cadmium is classified as a probable human carcinogen, and source/exposure assessment has been completed. A Federal Register notice proposing EPA's Intent to List cadmium under section 112 was published on October 16, 1985 (50 FR 42000). A public hearing was held on December 16, 1985. Studies to develop NESHAP are currently underway.

Carbon Tetrachloride

Health evaluation and SAB review are complete; carbon tetrachloride is classified as a probable human carcinogen. Public health risks are principally the result of worldwide, low-level concentrations that appear to be increasing because carbon tetrachloride is very stable in the atmosphere. Emissions from large industrial sources constitute a proportion of those risks; grain fumigation is currently a much greater contributor, but will decrease dramatically because regulatory efforts currently are underway on grain fumigation under the Federal Insecticide, Fungicide and Rodenticide Act

(FIFRA). A notice announcing EPA's Intent to List carbon tetrachloride under section 112 was published on August 13 (50 FR 32621). Studies to develop NESHAP are currently underway.

Chlorobenzenes

The Health Assessment Document was completed in January 1985. Only one chlorobenzene (hexachlorobenzene) appears at this time to have a potential for adverse health effects (cancer), but air emissions and, thus, potential risks associated with exposure to hexachlorobenzene are negligible. A Federal Register notice announcing EPA's Intent Not to Regulate chlorobenzenes was published on August 13 (50 FR 32628). Public comment has been solicited.

Chloroform

The Health Assessment Document was reviewed by the SAB in December 1984. Their comments were incorporated and the document issued in final form in September. Chloroform is classified as a probable human carcinogen. A Federal Register notice announcing EPA's Intent to List chloroform under section 112 was published on September 27, 1985 (50 FR 39626). Studies to develop NESHAP are currently underway.

Chloroprene

The Health Assessment Summary was completed in January 1985. There is no sound evidence at this time of adverse health effects resulting from exposure to ambient concentrations. A Federal Register notice announcing EPA's Intent Not to Regulate chloroprene was published on September 27, 1985 (50 FR 39632). Public comment has been solicited.

Chromium

The Health Assessment Document completed SAB review in December 1984. Chromium is classified as a probable human carcinogen; however, substantial questions remain as to which species of chromium are carcinogenic. A *Federal Register* notice announcing EPA's Intent to List either total or hexavalent chromium was published on June 10, 1985 (50 FR 24317). Studies to develop NESHAP are currently underway.

Coke Oven Emissions

Coke oven emissions was listed as a hazardous air pollutant under section 112 on September 18, 1984. Emission standards are under consideration.

Dibenzofurans

Dibenzofurans are structurally very similar to dioxins and are emitted from the same sources. However, their health effects as not as well tested as dioxins, although they are believed to produce similar adverse effects. Dibenzofurans are generally being included in regulatory decision plans for dioxin. A Health Summary was completed in 1985; a full health asssment is underway. It should be completed in mid-1986.

Dioxin

The HAD for dioxin is complete and has been reviewed by the SAB. A major EPA study is underway to determine the sources and risks resulting from exposure to dioxin through all pathways. This study is scheduled for completion this spring. A decision on dioxin as an air pollutant may be made in conjunction with a decision on the multi-pollutant risks from municipal waste combustors in early 1987.

Epichlorohydrin

There is some evidence that epichlorohydrin produces cancer in test animals, but the evidence is much weaker than that for other carcinogenic chemicals. Also, there are only a limited number of sources in U.S. and estimated public health risks are very small. A *Federal Register* notice announcing EPA's Intent Not to Regulate epichlorohydrin under the Clean Air Act was published June 11, 1985 (50 FR 24575).

Ethylene Dichloride

SAB review is complete and the HAD was issued in final form in September 1985. Ethylene dichloride is classified as a probable human carcinogen. A *Federal Register* notice announcing EPA's Intent to List ethylene dichloride under section 112 was published on October 16, 1985 (50 FR 41994). Studies to develop NESHAP are currently underway.

Ethylene Oxide

Health Assessment and SAB review are complete; the document was issued in final form in May. Ethylene oxide is classified as a probable human carcinogen. A *Federal Register* notice announcing EPA's Intent to List ethylene oxide under section 112 was published on October 2, 1985 (50 FR 40286). Studies to develop NESHAP are currently underway.

Formaldehyde

Formaldehyde is widely used to produce other chemicals and products. Its largest use is in the manufacture of plastics and wood glues. It is also a product of combustion and is produced in the photochemical reaction process. A draft Health Assessment Document was reviewed by the SAB in mid-1985; it is scheduled to be revised and released in 1986. There is evidence of nasal cancer in animals and it is mutagenic in various test systems. A regulatory decision is scheduled in 1987.

Freon 113

Health Assessment evaluation and SAB review are complete. There is no evidence of adverse health effects resulting from exposure to ambient concentrations of Freon 113. A *Federal Register* notice announcing EPA's decision not to regulate Freon 113 was published June 10, 1985 (50 FR 24313)

Hexachlorocyclopentadiene

The Health Assessment Document was completed in November 1984. There is no evidence of adverse health effects resulting from exposure to ambient concentrations. A *Federal Register* notice announcing EPA's Intent Not to Regulate hexachlorocyclopentadiene was published on October 1, 1985 (50 FR 40154). Public comment has been solicited.

Manganese

Health Assessment and SAB review are complete. There is no evidence of adverse health effects resulting from exposure to measured or expected ambient concentrations. A *Federal Register* notice announcing EPA's decision not to regulate manganese was published on August 13, 1985 (50 FR 32627).

Mercury

Mercury was listed as a hazardous pollutant under section 112 in 1971. National emission standards were promulgated in 1973. A review of the current health information on mercury was completed in May 1984. It indicated no new health information that would suggest a need to revise the current standards. A *Federal Register* notice describing the review of the NESHAP and proposing minor procedural changes to the existing regulations was published on December 26, 1984. The EPA is presently developing a final package that incorporates public comment. Publication is scheduled for early 1986.

Methyl Chloroform

Health Assessment and SAB review are complete. There is no evidence of adverse health effects resulting from exposure to ambient concentrations of methyl chloroform. A Federal Register notice announcing EPA's decision not to regulate methyl chloroform was published on June 10, 1985 (50 FR 24314).

Methylene Chloride

A Health Assessment Document was completed and reviewed by the SAB in mid-1984. It concluded that available health evidence was controversial; increased tumors occurred in some exposed test animals, but of an unusual type. The SAB concurred that available evidence of carcinogenicity was in a category ("limited") that did not allow quantitative estimation of carcinogenic risks.

After that SAB review, the National Toxicology Program (NTP) reported on animal inhalation studies that show high apparent rates of cancer. Scientific review of these results took place on March 29, 1985.

The EPA subsequently developed a quantitative risk estimate from the NTP data. It was reviewed by the SAB in May and again in June 1985. The risk estimate was revised to incorporate SAB comments and completed.

The EPA also announced in the Federal Register on May 14, 1985, its decision to initiate a priority review of methylene chloride under section 4(f) of the Toxic Substances Control Act. As a result, EPA published an Advanced Notice of Proposed Rulemaking (ANPR) on October 17, 1985 (50 FR

42037) announcing EPA's intention to develop a comprehensive strategy for the regulatory investigation of methylene chloride, including possible regulation under the Clean Air Act.

Nickel

An interim health document has been completed. It will be returned to the SAB for further review in March 1986. Two nickel compounds clearly are carcinogenic but they do not exist in sufficient quantity in the ambient air to pose significant public risks. Substantial questions remain concerning the potential for adverse effects to result from exposure to other specific nickel compounds. Major new health research initiatives also have been undertaken by EPA to evaluate other major species. A Federal Register notice announcing EPA's decision on nickel is expected this summer.

Perchloroethylene

The Health Assessment Document completed SAB review in January 1985. It reviewed health evidence that was weak and controversial. However, the NTP released a new positive cancer study and it was scientifically peer reviewed on August 14. The effect of this new study was to greatly strengthen the evidence for cancer. A Federal Register notice announcing EPA's intent to list perchloroethylene under section 112 was published on December 26, 1985 (50 FR 52880). Studies to develop NESHAPs are currently underway.

Phenol

Phenol is used to manufacture other organic chemicals and products. A Health Summary was completed in mid-1985. There is little evidence of adverse health effects resulting from exposure to ambient concentrations; thus, no SAB review is planned. A regulatory decision package is in preparation. It is scheduled for completion in 1986.

Phosgene

Phosgene is used in the manufacture of other organic chemicals and plastics. A Health Summary was completed in early 1985. Phosgene is a known respiratory poison with pulmonary edema occurring at relatively low concentrations. A Health Assessment Document is underway but may not be completed until late 1986 because of the need to translate a large number of foreign studies. A decision on the need for SAB review will be made following completion of the draft HAD. A regulatory decision is scheduled in 1987.

Polycyclic Organic Matter (POM)

A Federal Register notice was published August 8, 1984 (49 FF 31680), announcing EPA's decision not to regulate POM as a class of compounds under the Clean Air Act. Specific source categories whose emissions contain POM, such as coke ovens, automobiles, wood stoves, and diesel vehicles, are being or will be considered for regulation (see Coke Oven Emissions) under various provisions of the CAA.

Radionuclides

Radionuclides were listed as a hazardous air pollutant in December 1979. In February 1985, final regulations for elemental phosphorous plants, Department of Energy (DOE) facilities, and facilities licensed by the Nuclear Regulatory Commission and non-DOE facilities were promulgated. Final regulations for underground mines were issued April 17, 1985.

Toluene

A Federal Register notice was published June 6, 1984 (49 FR 22195) announcing EPA's decision not to regulate toluene as a specified air pollutant because of lack of evidence that adverse health effects result from exposure to measured or expected ambient concentrations.

Trichloroethylene

The Health Assessment Document completed SAB review in December 1984. The health evidence, while controversial, is sufficient to classify trichloroethylene as a probable human carcinogen. A Federal Register notice announcing EPA's intent to list trichloroethylene was published on December 23, 1985 (50 FR 52422). Studies to develop NESHAPs are currently underway.

Vinylidene Chloride

The Health Assessment Document completed SAB review in January 1985. The health evidence is weak and controversial. Numerous animal cancer studies have been conducted with negative results; one study is positive. The EPA has concluded that there is insufficient evidence to classify vinylidene chloride as a carcinogen, and acute toxicity only occurs at concentrations far greater than expected in the ambient air. A Federal Register notice announcing EPA's decision not to regulate vinylidene chloride was published on August 13 (50 FR 32632).

Vinyl Chloride

Vinyl chloride was listed as a hazardous pollutant in December 1975. Emission standards were promulgated in October 1976 for ethylene dichloride/vinyl chloride monomer plants and polyvinyl chloride production. The health basis and existing standards have completed review by EPA; no information was found indicating a need to revise existing standards. A Federal Register notice proposing only administrative changes to the current standards was published on January 6, 1985. The public comment period closed on March 25, 1985. A final package is scheduled for publication in 1986.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D.C. 20460

NOV 25 1986

THE ADMINISTRATOR

Honorable John D. Dingell
Chairman, Subcommittee on Oversight
and Investigations
Committee on Energy and Commerce
U.S. House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

Thank you for your September 15, 1986 inquiry regarding the Reasonable Extra Efforts Program (REEP). Responses to your questions will be forthcoming shortly.

We previously informed you that the General Counsel was reviewing the legal issues associated with the problem of ozone nonattainment, including an evaluation of the REEP and Sustained Progress programs, and an analysis of potential sanctions. The General Counsel has completed his review, and a copy is enclosed. He concludes that the programs are defensible, but that their implementation entails significant legal risk, and numerous opportunities exist for litigation that could substantially impede our efforts.

As you know, the question of how EPA should respond to the problem of long-term, widespread nonattainment of the ozone standard goes to the heart of the Clean Air Act. On the one hand, a strict reading of the Act could lead to massively disruptive measures. In some areas of the country, it is not even clear that attainment is possible in any realistic sense in the short term. On the other hand, the "reasonable extra efforts program" raises significant questions, not the least of which is its potential legal vulnerability.

Given these competing concerns, I believe the responsible course for EPA to pursue is as follows: First, I have directed my staff to quantify, in a rough fashion to the extent possible, the types of measures that would be necessary to bring various categories of nonattainment areas into compliance. On its face, it seems clear that in the areas with the most intractable nonattainment problems, such as the REEP areas in California, extremely disruptive measures, with enormous adverse social and economic impacts, would be necessary to bring about attainment. In fact, it would take an enormous effort just to identify any measures, however disruptive or unreasonable, to demonstrate compliance. However, we expect our analysis to progress quickly enough that we will soon be able to begin a reasoned discussion of the dilemma we face. As this analysis progresses, I will share the results with the Congress.

Second, over the next two months, the Agency will assess the comments we received in response to the REEP *Federal Register* notice and public hearing. Third, the Agency will continue our work on the development and implementation of a national ozone policy.

I believe that a full public airing of the issues related to ozone nonattainment is absolutely essential to the development of a workable and reasonable program. I look forward to discussing these issues with you and with the Congress.

Sincerely,

Lee M. Thomas

Lee M. Thomas

Enclosures

cc: Comptroller General of the United States
(with enclosures)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

NOV 25 1986

OFFICE OF
GENERAL COUNSEL

MEMORANDUM

SUBJECT: Legality of the Sustained Progress Program and REEP under the Clean Air Act

FROM: Francis S. Blake
General Counsel

TO: The Administrator

Executive Summary

You have asked us to review the legality of the measures the Agency is now considering to assure progress in the areas of the country that are unlikely to attain the National Ambient Air Quality Standard for ozone by 1987. These measures, referred to as the Sustained Progress Program (SPP) and the Reasonable Extra Efforts Program (REEP), have been described in general terms to the public, most recently in a Federal Register notice issued by Region IX.

The analysis set forth below represents our preliminary assessment of the legal risks involved with these programs. The Agency has requested comments on the legal issues in Region IX's Federal Register notice. We anticipate that those comments will raise issues and arguments that we have not addressed in this analysis and, accordingly, that this analysis will be refined over time as we review the comments and as the Agency's programs take on more definitive shape.

Our assessment at this point is that these programs, while defensible, present major legal problems and that the risk of an adverse court decision is significant. The basic structure of the Act contemplates a planning and implementation effort by the states that takes as its goal attainment of the NAAQS by a date certain. Because that goal appears unattainable in the short term absent draconian measures, these programs substitute as a goal the implementation of new, but practicable, control measures. That constitutes a fundamental shift in the focus of the Clean Air Act.

The principal legal argument in support of such a shift is that Congress never contemplated the situation we are now facing -- persistent nonattainment that cannot be remedied without severe economic disruption, and even then not by the statutory deadline. The programs are thus defensible as a reasonable response to an unforeseen circumstance. As shown in our analysis, however, there are strong countervailing arguments that this situation was not unforeseen and that Congress intended the Agency to force the issue for Congressional reexamination by imposing sanctions and promulgating federal implementation plans.

Furthermore, SPP and REEP are premised on as yet undefined concepts of "reasonable" extra control efforts. Even if there were uniform acceptance of the general conclusion that SPP and REEP are valid responses to an unforeseen circumstance, these programs still face an uncertain future of litigation since there is a high probability that not all parties will agree that a particular control strategy is "reasonable." Once separated from the specific attainment deadlines in the Act, decisions on particular control strategies may appear as inherently legislative judgments and beyond the authority of the Agency.

It is possible that, like the Agency's 1983 Sanctions Policy, SPP and REEP may be broadly accepted by the interested public, and this would substantially lessen the legal risks involved. Unlike the 1983 Policy, however, SPP and REEP are subject to challenge at many different points during their implementation, and each challenge has the potential of invalidating the entire program.

In sum, our analysis finds that, as currently envisioned, SPP and REEP are defensible, but concludes that the legal risks are high.

BACKGROUND

A. SIP System

The Clean Air Act uses a system of "state implementation plans" (SIPs) as the chief mechanism for meeting the primary National Ambient Air Quality Standards (NAAQS). 1/ The Act

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1/ In the interest of simplicity, this memorandum discusses only those provisions of the Act that govern attainment and maintenance of primary NAAQS. Those provisions are more demanding than the provisions relating to secondary NAAQS. And the air quality standard of concern here, the ozone NAAQS, operates as both a primary and a secondary NAAQS. See 40 C.F.R. §50.9 (1986).

defines that system in three sets of provisions. One set, established by the 91st Congress in 1970, specifies the basic rules for creating SIPs for any primary NAAQS. The second set, engrafted onto that framework by the 95th Congress in 1977, prescribes how the original SIPs are to be revised to cure nonattainment. The third set details the availability of variances from SIP requirements.

1. The Basic Framework: Section 110

The first set of provisions calls for the rapid development of implementation plans that assure attainment by specific deadlines. Section 110(a)(1) directs each state to submit, within nine months after the promulgation of a primary NAAQS, a plan for implementing it. Section 110(a)(2) directs EPA to approve or disapprove it within four months. The plan must "provide" for attainment of the primary standard "as expeditiously as practicable," but no later than three years from approval, using "emission limitations, schedules, and timetables for compliance with such limitations, and such other measures as may be necessary", including transportation controls. Under section 110(a)(2)(H), a plan must also "provide":

> for revision . . . (ii) whenever the Administrator finds on the basis of information available to him that the plan is substantially inadequate to achieve the national ambient air quality primary or secondary standard which it implements or to otherwise comply with any additional requirements established under the Clean Air Act Amendments of 1977 . . . .

Section 110(c) directs EPA, in the event that it disapproves a submission or a state fails to submit a plan in response to promulgation of a NAAQS or a finding of SIP inadequacy, 2/ to propose and promulgate "an implementation plan, or portion thereof, for [the] State" generally within six months after the due date for the state plan. 3/

The Act provides EPA and the states only one specific mechanism during the planning process to temper the impact of essential, but draconian measures. Section 110(e) allows EPA, upon application of the relevant Governor, to extend the attainment deadline as much as two years beyond the original

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2/ Section 110(c)(1)(C) implies that a state has sixty days or such longer time as EPA may prescribe to respond to a finding of SIP inadequacy.

3/ Beyond this quoted phrase, the Act gives no positive indication of what the content of a federal plan should be. It does contain some negative indications. For instance, section 110(a)(5) bars EPA from promulgating certain "indirect source review programs." See also section 110(a)(3)(C).

three years, if the technology or other means necessary for attainment will not be reasonably available within that three-year period.

2. The Remedial Framework: Part D

The provisions in the Act for remedying NAAQS violations beyond the original deadlines mirror the basic SIP framework. The Act calls for rapid SIP revisions to assure attainment by new statutory deadlines. Section 107(d) required EPA, by roughly March 1978, to identify those areas which on August 7, 1977 (the date of enactment of the Clean Air Act Amendments of 1977) were still experiencing NAAQS violations. The states were required by January 1, 1979, to adopt and submit such revisions to the SIPs for those areas as would meet the requirements of Part D of Title I of the Act and section 110(a)(2)(I). Under Part D (specifically section 172), each revision was to "provide" for attainment of the relevant primary NAAQS "as expeditiously as practicable" but not later than December 31, 1982. A revision could "provide" for attainment of the primary standards for photochemical oxidants and carbon monoxide beyond that deadline, but not later than December 31, 1987, if the state demonstrated that attainment by the 1982 deadline was not possible despite the implementation of all reasonably available control measures (RACM).

Whatever the attainment deadline, each revision was to provide for the implementation of all RACM as expeditiously as practicable and "reasonable further progress" (RFP). Section 171(1) defines RFP as:

> annual incremental reductions in emissions of the applicable air pollutant . . . which are sufficient in the judgment of the Administrator to provide for attainment of the applicable national ambient air quality standard by the date required in section 172(a).

In addition, each revision was to have, among other things, a permit program for the review of new sources that would allow their construction, even before attainment occurs, upon a showing that the new source would comply with the lowest achievable emission rate (LAER), offset, and statewide compliance requirements that EPA had pioneered in its 1976 Offset Ruling. 4/

Beyond that, in the case of areas with 1987 deadlines, each revision due in 1979 had to identify any measures other than RACM that would be necessary to assure timely attainment and had to contain a commitment to adopt a motor vehicle

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4/ 41 Fed. Reg. 55524 (December 21, 1976).

inspection and maintenance program. In addition, each state with such an extension area was to submit a supplemental revision before July 1, 1982, containing in enforceable form those additional measures necessary "to assure" attainment by the end of 1987.

Section 110(a)(2)(I) required each SIP to contain a construction ban that would operate against major new sources in each nonattainment area after June 30, 1979, "unless, as of the time of application for a permit for such construction . . . , such plan meets the requirements of part D . . . ."

As a further incentive to encourage the adoption and submission of Part D SIP revisions, the 95th Congress added potential restrictions on highway funding and air pollution control grants in the form of section 176(a). That section bars DOT from funding all but certain highway projects, and EPA from making air grants, in any area:

> (1) in which any national primary ambient air quality standard has not been attained,
>
> (2) where transportation control measures are necessary for the attainment of such standard, and
>
> (3) where the Administrator finds after July 1, 1979, that the Governor has not submitted an implementation plan which considers each of the elements required by section 172 or that reasonable efforts toward submitting such an implementation plan are not being made (or, after July 1, 1982, in the case of an implementation plan revision required under section 172 to be submitted before July 1, 1982). 5/

A strong argument exists that the 95th Congress intended that EPA, apparently as a last resort, would be obliged to promulgate any necessary measures if a state failed to satisfy Part D. 6/

5/ The Act contains one other sanction for a failure to adopt and submit an adequate Part D SIP revision, namely, the withholding of grants for sewage treatment works under section 316.

6/ Section 172(b) provides: "The plan provisions required by subsection (a) shall -- (1) be adopted by the State (or promulgated by the Administrator under section 110(c)) after reasonable notice and public hearing . . . ." (Emphasis added.)

SIPs did not "provide" for attainment by the end of 1982 as required by Part D. 8/ The public comments all strongly opposed the proposal. 9/

In response to the public comments, EPA withdrew its proposal and amended the regulations embodying the ban to say that the ban "shall not apply to any nonattainment area once EPA has fully approved the State implementation plan for the area as meeting the requirements of Part D." 10/

EPA explained the basis for its decision not to impose the construction ban by emphasizing the planning function of SIPs:

> EPA now agrees that the better interpretation of the Act is that Section 110(a)(2)(I) and Part D were intended to produce revised plans that appeared to "provide for" attainment by the 1982 or 1987 deadlines. EPA agrees that the language and legislative history of Section 172(a)(1) suggest that SIPs were only expected to "provide for" attainment in a prospective or planning sense. 11/

EPA further decided that "none of the funding restrictions in the Act apply to areas with approved and implemented Part D plans that only missed the 1982 attainment date." 12/

As for the course EPA would follow, EPA stated:

> Where a fully approved Part D plan failed to bring about attainment by the end of 1982, EPA will treat the plan as "substantially inadequate" to assure

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8/ 48 Fed. Reg. 4972 (February 3, 1983).

9/ In response to EPA's proposal, the Congress enacted an amendment to the FY 1984 appropriations legislation that prohibited the expenditure of funds appropriated for that fiscal year for imposition of Clean Air Act sanctions "for failure to attain any national ambient air quality standard . . . . " Pub. L. 98-45, 97 Stat. 226 (July 12, 1983).

10/ 48 Fed. Reg. 50697 col. 3 (§52.24(a)).

11/ *Id.* at 50690-91 (emphasis added).

12/ *Id.* at 50691 col. 2.

3. SIP Variances

The Act restricts the ability of the federal and state governments to temper the stringency of requirements in an approved SIP. Section 110(i) specifies the circumstances in which SIP requirements may be modified. They are as follows: Under sections 110(f) and (g), temporary emergency suspensions of SIP requirements may be obtained, but they can last no longer than four months. Under section 119, certain smelters may obtain postponements of requirements in the applicable SIP for continuous emissions reductions, but only so long as the primary NAAQS is not violated and the postponements do not run beyond January 1, 1988. Under section 118(b), the President may exempt any emissions source owned or operated by an arm of the executive branch from a requirement in a SIP, but only upon a determination that the exemption is "in the paramount interest of the United States". The exemption may last for only one year, although the President may renew it annually upon new determinations. Under section 113(d), individual stationary sources may obtain "delayed compliance orders" that postpone compliance with SIP requirements, but generally not beyond three years from the original compliance deadline and in no event beyond five years. 7/ Finally, under Section 110(a)(3), a state may revise its plan at any time, but EPA can approve the change only if it will not interfere with timely attainment and maintenance of the NAAQS.

B. EPA's 1983 Sanctions Policy

In February 1983, EPA proposed to disapprove the SIPs for a large number of "nonextension" areas -- the ones subject to the 1982 attainment deadline -- and to impose the construction ban in those areas. The proposal reasoned that, since those areas were still experiencing violations, their

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7/ EPA, as prosecutor under the relevant enforcement provisions of the Act (for instance, section 113), has discretion not to bring enforcement actions. But section 110(i) and its legislative history strongly indicate that Congress did not want EPA to exercise that discretion for the purpose of providing relief from SIP requirements. H.R. Rep. No. 95-564, 95th Cong., 1st Sess. 133-34 (1977)("1977 Conference Report"); H.R. Rep. 95-294, 95th Cong., 1st Sess. 53-69 (1977)("1977 House Report"); Sen. Rep. No. 95-127, 95th Cong., 1st Sess. 44-48 (1977)("1977 Senate Report").

> attainment under Section 110(a)(2)(H) and call for a SIP revision. EPA will provide one year for the submittal of the new revision under Section 110(c)(1)(C). The revisions will have to provide for attainment as expeditiously as practicable 13/

EPA warned that if a state failed to respond adequately to a call for a SIP revision, it would impose a ban on construction and air grants for failure to implement the SIP. This failure would be premised on the provision that is assumed to exist in each SIP under section 110(a)(2)(H) requiring the state to revise its SIP upon a call from EPA. Section 173(4) bars the issuance of permits, and section 176(b) the issuance of air grants, if a state is failing to carry out its SIP. With respect to areas still lacking approved plans, EPA reaffirmed that the section 110(a)(2)(I) ban should remain in effect; threatened highway funding restrictions; and advised that, in view of the passage of the 1982 deadline, the relevant SIPs need only provide for attainment as expeditiously as practicable. 14/

No one has challenged these decisions on sanctions for nonextension areas in court.

C. Implementation of the Ozone NAAQS

EPA promulgated the current ozone NAAQS in February, 1979. 15/ By early 1983, EPA had received the Part D SIP revisions due in 1979 for most of the areas it had identified as nonattainment for ozone and had fully or conditionally approved most of them. 16/ As a result, the construction ban in section 110(a)(2)(I) was generally not in effect with respect to new emissions of ozone precursors. 17/

13/ *Id.* at 50693 col. 1.

14/ *Id.* at 50694 col. 2.

15/ *See* 44 Fed. Reg. 8202 (February 8, 1979).

16/ 48 Fed. Reg. 50686, 50687 cols. 2-3 (November 2, 1983).

17/ In July 1979, EPA inserted the ban into the SIP of each state by an interpretive rule. 44 FR 38471 (July 2, 1979) (now codified at 40 C.F.R. §52.24(a)(1986)). The ban came into effect immediately in practically every nonattainment area, since at that point EPA had yet to approve practically any submissions. *Id.* at 38471 col. 2. Gradually, areas gained EPA approval, thereby lifting the ban. While the ban originally went into effect automatically by operation of law, it can go into effect again in an area only by an affirmative EPA disapproval of the SIP, according to longstanding EPA interpretation. See 46 Fed. Reg. 62651 col. 2 (December 28, 1981); 48 Fed. Reg. 50687 col 2.

EPA in due course called for SIP revisions for many ozone nonextension areas, and has received many submissions as a result. EPA has acted on a few, but has yet to impose any restrictions on construction or funding.

Meanwhile, EPA has been acting on submissions of the second round of Part D SIP revisions that were due by mid-1982 for ozone "extension" areas. EPA has approved many of these submissions fully or conditionally. Examples are the SIPs for New York, New Jersey, and Houston. In 1984, in the case of four areas in California (the South Coast Air Basin, Fresno County, Ventura County, and the Sacramento area), EPA approved the new control measures the state had submitted, but deferred action on the RFP and attainment demonstrations. 18/ One effect of this action was to keep the construction ban out of effect in the four areas.

An individual, Mark Abramowitz, subsequently petitioned the Ninth Circuit to review EPA's actions on those four California SIPs. The parties asked the court to stay the proceedings to allow EPA to implement a "reasonable extra efforts program" (see pp. 9-11, infra.). The court granted that request. Petitioner's brief is now due on December 26, 1986.

Several months ago, two citizens groups notified EPA that they intend to sue EPA on the Sacramento ozone SIP. They claim that EPA has a mandatory duty to act on the SIP, to impose sanctions, including the construction ban, and to promulgate a substitute federal plan. 19/ Recently, the State

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18/ 49 Fed. Reg. 30300, 30304 col. 1, 30305 col. 3 (July 30, 1984).

19/ Letter, April 1, 1986, Brecher, Attorney for Sierra Club and Environmental Council of Sacramento, to Ayres, Region IX Regional Administrator ("Re: Sacramento Air Pollution Situation").

Another citizens group, the Arizona Center for Law in the Public Interest (ACLPI) has sued EPA already under section 304 in similar circumstances. It seeks to compel EPA to disapprove the SIPs for carbon monoxide for Phoenix and Tuscon, to impose the construction ban, and to promulgate a federal plan. It also seeks similar actions relating to particulate matter for the two areas. The court has stayed the proceedings pending several actions by EPA and the state, including a determination -- due by the end of this year -- on whether the state is making reasonable efforts to create an adequate attainment plan for carbon monoxide.

(footnote continued)

of Wisconsin issued a press release stating that it intends to sue EPA to compel promulgation of a federal ozone SIP for the greater Chicago area, which is an extension area still lacking an approved Part D plan. 20/

D. The Sustained Progress and Reasonable Extra Efforts Programs

SPP and REEP represent the Agency's present attempts to structure a response to the 1987 deadline in the Clean Air Act. 21/ As outlined in your speech to the Air Pollution Control Association (APCA) in June of this year and in Region IX's Federal Register notice on REEP, the aim of these programs is to achieve steady improvement in air quality by adding new control measures to the SIP and by improving the effectiveness of existing measures. For purposes of this analysis, both programs rest on the same critical tenets:

(1) A substantial number of areas across the country will not be able to achieve attainment by 1987, or even five years later, despite diligent efforts.

Footnote 19/ Continued

Finally, the Western Oil and Gas Association recently sued under section 304 to compel EPA to conduct notice and comment rulemaking on REEP before implementing it, on the theory that the Administrative Procedure Act imposes a mandatory duty on EPA to do that. Western Oil and Gas Ass'n v. Thomas, Civ. No. 86-7530TJH (Tx) (C.D. Cal.).

20/ NRDC also notified EPA recently that it intends to sue New York to compel full implementation of the approved ozone SIP for New York City and EPA to compel revision of the approved carbon monoxide SIP for the same area. Letter, October 16, 1986, Strait and Goldstein, Attorneys for NRDC, to Thomas, EPA Administrator, et al. ("Re: Notice and petition for implementation of ozone strategies in the 1982 New York State Air Quality Implementation Plan Revision and for revision of Carbon Monoxide portions of the plan"). In addition, attorneys for NRDC recently told EPA attorneys informally that NRDC intends to file a similar notice with respect to implementation and revision of the ozone SIP for New Jersey.

21/ Since REEP is essentially a Sustained Progress Program tailored to the circumstances of the four California ozone nonattainment areas, this discussion will treat the two programs as interchangeable.

(2) Only draconian measures and severe economic disruption would even theoretically yield attainment within the statutory time period.

Based on these conclusions, the programs focus on relative improvements in air quality rather than attainment dates and emphasize the control aspect of the SIP process rather than the planning aspect. Sanctions would be imposed not for failure to attain the statutory deadlines but for a state's failure to make reasonable efforts to consider and implement identified controls. As set out in the recent Federal Register notice, REEP contains five key elements:

1. Surveys of Available Control Measures. EPA in close co-operation with state and local agencies already has searched and periodically will continue to search for control measures that appear to be feasible and effective for the relevant areas, but that are as yet not in the SIP.

2. Audits of Existing Control Programs. EPA again in close co-operation with state and local agencies has audited, is auditing, and will be auditing the control programs that the SIP already contains in order to identify ways to improve those programs.

3. Demand for Committal SIPs. EPA has called upon California to adopt and submit by February 1987 for each area as a SIP revision a package of enforceable schedules and commitments (a) to search for new available control measures, (b) to co-operate actively in the EPA audits, (c) to decide whether to adopt and implement the control measures and program improvements identified by EPA's or the state's efforts, (d) to carry out any decision in the affirmative and justify any decision in the negative, and (e) to re-perform these tasks on two-to-three-year cycles until the area is free of violations. EPA will go through notice and comment rulemaking to approve or disapprove each submission of a committal SIP.

4. Periodic Findings of Reasonable Efforts and SIP Implementation. EPA periodically will evaluate the efforts of the state to determine whether those efforts are reasonable and whether the state is carrying out the SIP.

5. Enforcement. If EPA determines that the state is failing to make reasonable efforts with respect to a particular area, it would undertake notice and comment rulemaking to impose the construction ban under section 110(a)(2)(I) and funding restrictions under section 176(a). 22/ The Region stated in the notice that EPA would treat a failure to submit a committal SIP as a failure to make reasonable efforts. If EPA determines that the state is failing to implement the SIP, it would undertake notice and comment rulemaking to impose a construction ban under section 173(4) and funding restrictions under sections 176(b) and 316(b). 23/

The REEP notice and the APCA speech leave open the question of what constitutes a reasonable planning effort and, in particular, the question of when a refusal to adopt an identified measure is unreasonable. They are also silent on whether EPA would promulgate measures of its own in the event of a planning failure by the state.

DISCUSSION

The fundamental legal issue presented by SPP and REEP is whether EPA has the statutory authority to shift the focus of the Act from NAAQS attainment by specified deadlines to a control program based on a regulatory definition of "reasonable further progress" and attainment "as expeditiously as practicable."

A. Framework for Analysis

A recent Supreme Court decision on Clean Air Act issues, Chevron, U.S.A., Inc v. NRDC, sets the relevant framework for analysis:

> When a court reviews an agency's construction of the statute which it administers, it is confronted with two questions. First, always, is the question whether Congress has directly spoken

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22/ Actually, the notice is silent on whether EPA would trigger the construction ban at the same time that it imposes the section 176(a) sanctions. But for purposes of this memorandum, we assume that EPA would trigger it as well.

23/ The description of REEP in the notice appears mainly at 51 Fed. Reg. 34428, 34431-35 (September 26, 1986).

> to the precise question at issue. If the intent of Congress is clear, that is the end of the matter; for the court, as well as the agency, must give effect to the unambiguously expressed intent of Congress. If, however, the court determines Congress has not directly addressed the precise question at issue, the court does not simply impose its own construction on the statute, as would be necessary in the absence of an administrative interpretation. Rather, if the statute is silent or ambiguous with respect to the specific issue, the question for the court is whether the agency's answer is based on a permissible construction of the statute.
>
> . . . Sometimes the legislative delegation to an agency on a particular question is implicit rather than explicit. In such a case, a court may not substitute its own construction of a statutory provision for a reasonable interpretation made by the administrator of an agency.
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> * * * *
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> ". . . If [the agency's] choice represents a reasonable accommodation of conflicting policies that were committed to the agency's care by the statute, we should not disturb it unless it appears from the statute or its legislative history that the accommodation is not one that Congress would have sanctioned." 24/
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> * * * *
>
> When a challenge to an agency construction of a statutory provision, fairly conceptualized, really centers on the wisdom of the agency's policy, rather than whether it is a reasonable choice within a gap left open by Congress, the challenge must fail. 25/

24/ 104 S.Ct. 2778, 2781-83 (1984)(footnotes and citations omitted).

25/ *Id.* at 2793. *See also* *Train v. NRDC*, 421 U.S. 60, 87, 95 S.Ct. 1470, 1485 (1975); *Morton v. Ruiz*, 415 U.S. 199, 231, 94 S.Ct. 1055, 1072 (1974); *Citizens to Save Spencer County v. EPA*, 600 F.2d 844, 873-74 (D.C. Cir. 1979). *Cf.* *District of Columbia v. Orleans*, 406 F.2d 957 (D.C. Cir. 1968) (Leventhal, J.)

B. SPP in Areas With an Approved Part D Plan

1. Specific Congressional Intent

The threshold issue in evaluating SPP is whether the 95th Congress had any specific intent on how EPA was to deal with NAAQS violations beyond the applicable statutory deadline.

The statute is clear on several points. Sections 110(a)(2)(H) and 110(c)(1)(C) show that the Congress intended to empower EPA to find that a plan is substantially inadequate to achieve a NAAQS, to call upon the relevant state to upgrade the plan, and to give that state a reasonable amount of time to respond. 26/ The statute, however, is ambiguous on the questions of whether a finding of inadequacy automatically triggers the section 110(a)(2)(I) ban in an area with an already approved plan; what the content of a SIP revision must be beyond assuring attainment as expeditiously as practicable; and what the consequences are if a state fails to submit an adequate plan in response to a SIP call.

A partial response to these ambiguities can be found in the Agency's 1983 Sanctions Policy. At that time the Agency considered two conflicting versions of the significance of the statutory attainment deadlines.

On the one hand, there was the view that has been espoused by the Comptroller General (GAO) in a series of letters to Congressman Dingell. 27/ Under this view, the requirements of section 172 are continuously applicable as a yardstick for measuring the existing SIP and an incoming SIP revision. This means that a finding of inadequacy automatically triggers the section 110(a)(2)(I) construction ban since the ban applies by its own terms whenever the SIP is not meeting "the requirements of Part D." One requirement of Part D is that a plan "provide" for attainment by the relevant statutory deadline and also, in the case of an extension area, "assure" attainment by then. A plan that does not achieve attainment

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26/ The Act is unclear as to whether EPA has a mandatory duty to make findings of SIP inadequacy. Section 110(a)(2)(H) is merely part of the recipe for SIP content; it is not aimed at EPA. Beyond that, it triggers an obligation on the part of a state, but only "whenever" EPA makes the necessary finding. It thus appears to leave entirely to EPA whether and when to make a finding.

27/ Letter dated February 28, 1986 (B-221421); Letter dated January 7, 1986 (B-208593); Letter dated April 21, 1983 (same); Letter dated December 30, 1982 (same).

by the statutory deadline does not provide for attainment or assure it. The ban under this view would apparently stay in effect until EPA redesignated the relevant areas as attainment. Although the GAO letters do not focus on what a revision in response to a SIP call would have to contain, presumably GAO would contend that the phrase "any additional requirements established under the Clean Air Act Amendments of 1977" in section 110(a)(2)(H) encompasses the requirements of Part D, since they stay alive even after EPA approval. Thus, the incoming SIP would have to provide at least for "reasonable further progress" and attainment as expeditiously as practicable. Finally, GAO would argue that the only consequence of a failure of a state to submit an adequate plan in response to a SIP call would be that EPA would have to promulgate an adequate plan of its own under section 110(c) within a six-month period. A construction ban would be in effect already, and the funding restrictions in section 176(a) would not be available. 28/

The second interpretation is the one EPA adopted in the 1983 Sanctions Policy. Under that view, Congress intended that a state would have to show only that its Part D SIP provides prospectively for timely attainment and otherwise satisfies section 172. The 1983 Sanctions Policy viewed the purpose of the construction ban not as a penalty for nonattainment but rather as a mechanism to force states to plan for future attainment. EPA's response to nonattainment in nonextension areas after 1982 was, therefore, only to require a new round of SIP revisions from those states that had failed to meet the standards. Those revisions, EPA said, would have to provide for attainment of the standards "as expeditiously as practicable."

The 1983 Sanctions Policy, however, provides only a partial answer to the legal issues posed by SPP. While the policy does resolve the issue of the automatic imposition of the construction ban for areas in nonattainment in 1982, it leaves unanswered several issues critical to the situation the Agency now faces with the 1987 deadline.

First, the legal analysis supporting the policy (see July 12, 1983 Memorandum from Acting General Counsel Barnes to Administrator Ruckelshaus, entitled "The 'Construction Moratorium' Under the Clean Air Act") gave weight to the fact that the statutory language of section 172 speaks of "providing for attainment" by 1982 rather than "assuring" attainment. Since section 172(c) requires extension area plans to "contain enforceable measures to assure attainment of the applicable

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28/ According to GAO, section 176(a) is not available, even though the requirements of Part D are continuously applicable, because the focus of the text of that section is entirely on the 1979 and 1982 planning cycles. However, the text is also open-ended in that it contemplates a finding by EPA "after July 1, 1979". Hence, it appears to be susceptible to a contrary interpretation.

standard not later than December 31, 1987" (emphasis added), arguably the GAO view of the significance of the deadlines has more force for the 1987 deadline than for the 1982 deadline. That argument, however, is unpersuasive.

The key focus of the OGC memorandum was on the following passage from the transcript of a committee mark-up where the "provide for" language was first introduced by Senator Domenici:

> . . . I am substituting for the words "assures," "provides for attainment by the specified date."
>
> That may not seem like a big change, but the phrase "provides for" is used in the existing law where the word "assure" is not. It does not require a State to guarantee a program that will result in attainment. A guarantee certainly is difficult to make, given all the knowledge and lack of knowledge that we have been [sic] the oxidant formation and other things. But the language requires a state, with EPA approval, to set a strategy in motion that it currently believes will meet the standards. That is the first change. [Transcript of Senate Clean Air Act Mark-Up, May 4, 1977, at 13-14 (emphasis added).]

The wording the Senator used, especially the underlined sentence, strongly suggests that the committee was concentrating at that point in their mark-up only on how the states and EPA were to gauge the new attainment demonstrations in advance of the attainment deadlines, and not on what the consequences would be if a SIP, once approved, failed to achieve attainment. Thus, the phrases "provide for attainment" and "assure attainment" appear to communicate only the test EPA was to apply to Part D submissions, and not the consequences of their ultimate failures, if any. Apparently, the committee agreed that the test for extension areas should be especially rigorous and the test for nonextension areas more moderate. But surely the discussion would have been more extensive and taken on a different complexion if the Senator was intending both to fix the consequences of a failure to attain and possibly to treat extension areas differently than nonextension areas in that regard. In any event, this passage is by no means a clear indication that the Congress intended the ban to come into effect upon a failure of an approved SIP to attain in an extension area. Thus, we believe that the rationale of the 1983 Policy with respect to automatic imposition of the construction ban is as valid for the 1987 deadline as the 1982 deadline.

The 1983 Sanctions Policy, however, does not resolve the question of whether a revision submitted in response to a SIP call must provide for attainment by a specific date. Section 110(a)(3), by requiring assessment of SIP revisions against the yardstick of section 110(a)(2), suggests that such a revision must provide for attainment within three years from its approval by EPA. Section 110(a)(2), however, expressly connects the three-year deadline only with original plans submitted in response to a new NAAQS or to a revision of a NAAQS, and not with plans submitted in response to a SIP call. The text of the Act is simply unclear on this point, and, the legislative history does not firmly resolve this uncertainty. 29/

We take as a given, based on the reasoning of the 1983 Sanctions Policy, that the construction ban is not a punitive device; it is primarily a mechanism for encouraging planning. But the core issue posed by a sustained progress program is the definition of the goal of the planning process itself. Here again, there are two very different possible definitions.

On the one hand, the Act can be read as requiring that the planning process be directed to attainment by a date certain. Under this view, the 1983 Sanctions Policy did not affect in any way the paramount significance of an attainment date. It dealt solely with a deviation in the planning process where controls for attainment, although adequately planned for in the past, fell short in reality. The new round of SIP revisions would simply provide a mechanism for delayed attainment, using an attainment date no more than three or five years past the statutory date.

SPP, on the other hand, is premised on a view of a planning process that is divorced from any specific attainment date and looks instead to measuring the controls that are "reasonably available." The availability of such controls then defines the attainment goals. If those controls would provide attainment within five years, then that is the goal of the planning process. But if even with those controls, attainment could not be projected for ten years, twenty years or the foreseeable future, the planning and implementation process would still satisfy the requirements of the Act.

29/ During the debates in 1977 on the Senate forerunner of the 1977 amendments, Senator Muskie stated that a revision in response to a SIP call would have to provide for attainment within three years from approval. See 123 Cong. Rec. S9165 col. 1 (daily ed., June 8, 1977). But this lone statement, which was merely part of a general description of how the 1970 version of the Act would operate, is far from dispositive.

The legal rationale supporting this view is as follows: As indicated above, section 110(a)(2) does not clearly establish any mandatory attainment deadline for plans submitted in response to a SIP call. Similarly, section 110(a)(2)(H) suggests that it is for EPA to decide what are and what are not substantial inadequacies warranting a SIP call. This in turn suggests that EPA has discretion to set deadlines that would reasonably accommodate the purposes of the statute. SPP attempts to reach such a reasonable accommodation by balancing, on the one hand, Congress's clear intent to avoid severe social and economic disruption and, on the other, Congress's intent to provide for steady air quality improvement. 30/

The rationale has force when viewed in the context of the 1977 legislative history. The legislative debates reveal that the 95th Congress believed it had struck the balance between air quality improvement and reasonable economic growth. A statement by Congressman Waxman during the House debates on the conference bill illustrates this attitude that attainment was possible without severe disruption:

> Many of our cities suffer from unhealthy levels of air pollution. Without some flexibility and direction from the Congress, any further growth which adds to this pollution would be prohibited. There is no other single issue which more clearly poses the conflict between pollution control and new jobs. We have determined that neither need be compromised. The current imminent deadlines for air quality improvement will be extended for 10 years. Communities are given an option of continuing to secure trade-offs for pollution from new sources, or comprehensively revising their plans to assure attainment -- through areawide pollution reductions -- by the late 1980's.
>
> This is a fair and balanced approach, which will not undermine our economic vitality, or impede achievement of our ultimate environmental objective. 31/

30/ We assume for purposes of this analysis that SPP would achieve its stated aim of reducing ozone concentrations over time by enhancing the effectiveness of, and supplementing, the existing approved SIP. Thus, we assume that the existing SIP would operate to prevent growth in the numbers and usage of mobile and stationary sources from nullifying the positive effects of SPP.

31/ 123 Cong. Rec. H8669 col. 3 (daily ed., August 4, 1977) (emphasis added).

More generally, the Congress seemed to embrace the view that the failure to reach attainment by the original attainment deadlines in the mid-1970's was due largely to failures to implement the system, rather than an inherent flaw in the system. 32/

The 95th Congress was also well aware of the collapse of the federal efforts to impose transportation control requirements in the first half of the 1970's and understood the importance of having the states develop their own control measures if at all possible. SPP gives due recognition to the importance of preserving state prerogatives and flexibility.

At bottom, though, the legal defensibility of SPP rises or falls on one central point: Congress did not address the possibility that nothing short of draconian measures would bring about attainment. Since it did not anticipate a choice between economic disruption and nonattainment, the statute provides no answer other than to avoid, through "reasonable" and "practicable" measures, the conflict between these two evils.

There is thus a defensible legal rationale for the Sustained Progress Program. However, the rationale has significant vulnerabilities and poses legal problems of a far greater import than those posed by the 1983 Sanctions Policy.

A strong argument can be made that Congress did anticipate in 1977 this conflict between equally unpalatable evils and expressed its preference for attainment (or at least a plan that would show attainment) of the NAAQS by the statutory deadlines.

The 95th Congress, in passing the 1977 amendments, strongly reasserted that attainment of the primary NAAQS was the paramount aim of the Act. This is of course obvious from sections 101(b)(1), 110(a)(2), 110(a)(2)(H), 172, and the

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32/ See 123 Cong. Rec. S13697 col. 1-2 (August 4, 1977) ("initial neglect" by EPA of transportation control requirements in the early 1970's); id. at S13702 col. 2 (not enough time to permit adjustments in the social and economic fabric so as to avoid disruption); id. at S9164 col. 3 (June 8, 1977) (relaxation of automobile emission standards); 1977 Senate Report, at 14 (same); 123 Cong. Rec. S9165 col. 2 (June 8, 1977) (lack of adequate emission inventories); id. at S9167 col. 2 (lack of public participation at the state level in formulation of transportation control plans); 1977 Senate Report, at 38 (same); id. at 55 (failure to take new source growth adequately into account); 1977 House Report, at 207 (energy crisis and economic recession in early 1970's; pollution was worse than anticipated; source noncompliance).

structure of the Act. Beyond that, the chief sponsor of the amendments in the Senate, Senator Muskie, emphasized the point during the debates on the conference bill:

> So, Mr. President, we begin again. This time with a more specific law; this time with a greater burden on localities; this time with more tools and more flexibility. But still with a very basic objective of protecting the health and welfare of the people of this land. No one, and I underscore no one, should be led to believe that this Act by its modification of the 1970 law means an abandonment of those objectives. There is built into this new law the very necessary provisions which will force communities to make choices, the result of which will be protection of public health. 33/

Likewise, the chief sponsor in the House, Congressman Rogers, stated during the conference debates:

> The conference agreement is founded on several major principles. First, and foremost, protection of the public health remains the paramount purpose and value under the Act 34/

More importantly, while it is true that Congress believed that it had secured the paramount goal of health protection without occasioning economic disruption, it is not at all clear that it intended EPA to make the value judgment on what amount of disruption is intolerable. Indeed, an argument can be made that the deadlines in the Act were intended to remove those value judgments from the Agency's hands and to provoke further legislative review if nonattainment were persistent. Such a view is reflected in the statements of Senator Stafford during debate on the Senate forerunner of the conference bill:

> These extensions [to 1982 and 1987] are 7 and 12 years, respectively, beyond original deadlines for most areas and should be attainable without economic disruption.
>
> It should also be noted that these deadlines [of 1982 and 1987] will not require adoption of "draconian" control measures. The bill provides that those areas with the most intractable oxidant problems commit

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33/ 123 Cong. Rec. S13697 col. 1 (daily ed., August 4, 1977).

34/ Id. at H8663 col. 1 (daily ed., August 4, 1977).

themselves in 1979 plan revisions only to reasonable measures to meet the 1987 deadlines. A second round of planning must be completed by 1982, providing plenty of time for legislative relief, should the 1987 date prove unattainable for a handful of areas. 35/

Similarly, it is possible to argue that Congress linked the planning effort with a specific attainment date not only because it thought that strong efforts would lead to attainment by 1987 but also because it wanted to force the development of pioneering or extraordinary efforts or at least identify their need. Thus, the 1977 conference report states:

> Providing for attainment in the context of a 1987 deadline means a State must submit a plan in 1979 requiring implementation of all reasonably available control measures. In addition, the plan must list other measures, if any, which may not be reasonably available but which would be needed to meet a 1987 deadline. The State need not make a commitment in 1979 to implement these latter measures. A second plan revision must be submitted by July 1, 1982, if implementation of all reasonable measures contained in the earlier revisions are not sufficient to meet the 1987 deadline. The plan submitted in 1982 must require implementation of enforceable measures needed to attain the primary standards by 1987. 36/

In sum, there are strong arguments that the situation confronting EPA at this point was not unforeseen and that Congress intended the Agency to press for a third round of upfront planning aimed at assuring attainment by specific deadlines.

2. Assessment of Legal Risk

As indicated, we believe that SPP is legally defensible. It should be emphasized, however, that, unlike the 1983 Sanctions Policy which has never faced and is unlikely to face legal challenge, the implementation of SPP will present several decision points where a legal challenge is possible, if not likely.

35/ 123 Cong. Rec. S9186 col. 3 (daily ed., June 8, 1977).

36/ 1977 Conference Report, at 157. *See also* 123 Cong. Rec. S13702 cols. 1 & 2 (daily ed., August 4, 1977)(Senate conference debates).

There are three distinct legal phases relevant to nonattainment areas with previously approved plans: (1) a finding of SIP inadequacy; (2) the determination of the appropriate SIP content; and (3) potential consequences of an inadequate state response.

With respect to the first phase, EPA initially would make findings of SIP inadequacy, call for revisions, and give states a reasonable amount of time to respond. Sections 110(a)(2)(H) and 110(c)(1)(C) indisputably authorize EPA to do that.

The program also contemplates that a finding of inadequacy would not trigger the section 110(a)(2)(I) ban. This is a safe position, considered in isolation. The regulations embodying the ban now expressly prevent it from applying in an area with an already fully approved plan. 37/

The more troublesome potential legal challenges would focus on the content of the SIP revisions themselves. In general terms, SPP calls for each state to periodically search for new available control measures, decide which to adopt and then implement any affirmative decision or else explain why a measure was not reasonable in the event of a negative decision. The expectation at this time is that the program would establish an iterative process of searching for and adding new controls. Such an approach has programmatic strengths and follows logically from the theory underlying the program, but it also increases legal vulnerability by creating repeated legal decision points.

Presumably, the Agency would begin by approving a "committal SIP" without acting on the plan as a whole and would incrementally approve plan additions as new control strategies were put in place. The first step and each subsequent step would be subject to challenge. The nature of the challenge could be broad -- focusing on the overarching legal issues discussed above, challenging EPA's authority to avoid the construction ban and its duty under section 110(c) to promulgate a federal plan -- or it could be narrow -- focusing on the specific "reasonableness" of the committal SIP or incremental approvals. This latter point is particularly important. For even if, as with the 1983 Sanctions Policy, there is uniform agreement among the commenters that SPP is the appropriate legal response to persistent nonattainment, the core of the program at this point rests on inherently

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37/ See 40 C.F.R. §52.24(a) (1986)(last sentence). See also Memorandum, July 12, 1983, Acting General Counsel Barnes, to Administrator Ruckelshaus ("The 'Construction Moratorium' Under the Clean Air Act").

subjective assessments of "reasonableness" and "practicability." It is probably unrealistic to expect unanimity on the application of those terms. The resulting litigation may create extended legal uncertainty both for the states and for the Agency.

Finally, SPP assumes that, if a state fails to submit any SIP revision or an inadequate one, EPA may impose a construction ban in the relevant nonattainment areas. This action would be defensible. The 1983 Sanctions Policy calls for the imposition of the ban in section 173(4), which applies in cases of failures to implement a SIP, where a state has made no submission or an inadequate one in response to a SIP call, on the theory that the state has failed to implement the provision in its SIP required to be there by section 110(a)(2)(H). It should be noted, however, that many SIPs may in fact lack such a provision. *See* 37 Fed. Reg. 10842, 10846 col. 1 (May 31, 1972). Beyond that, in the event the section 110(a)(2)(H) process broke down for an area, it can be argued that EPA has the power under sections 301(a) and 110(c) to maintain the air quality *status quo* through a construction ban. 38/

The Agency has also suggested that it might impose highway funding restrictions in areas with plans that had previously been fully approved. In a memorandum dated December 6, 1985, from Associate General Counsel William F. Pedersen Jr. to Richard D. Wilson, this office advised that EPA could defend the imposition of such a sanction. It is important to understand, however, that this position entails significant legal risks of its own. 39/

As noted in the Pedersen memorandum, the position that highway funding restrictions can be imposed is contrary to the 1983 Sanctions Policy. The 1983 Policy specifically states: "After reviewing the comments, EPA agrees that none of the funding restrictions in the Act apply to areas with approved and implemented Part plans . . . ." 48 Fed. Reg. 50691 col. 2. The theory underlying the 1983 Sanctions Policy as a whole was that the Part D planning requirements in the Act

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38/ This is essentially the same ban that EPA created as part of its 1976 Offset Ruling, 41 Fed. Reg. 55524, 55529 col. 1 (Condition 5 of §IV.A.).

39/ The Comptroller General has issued an opinion concluding that the highway funding sanction is not available for areas with fully approved plans. There is a threshold issue whether that opinion binds the Department of Transportation's disbursing officer. In light of the recent Supreme Court decision in *Bowsher v. Synar*, ___ U.S. ___, 106 S. Ct. 3181 (1986), we believe it is reasonable to assume that the Comptroller General could not require DOT to disburse funds in the face of an executive branch decision to withhold under section 176(a) of the Clean Air Act.

are, in effect, one-time obligations that once met are fully discharged. Since the highway funding sanctions are tied to the Part D requirements, they would no longer be available once a state had discharged its Part D obligations through an approvable plan.

The Pedersen memorandum stated that the Agency could defend a change from the 1983 Sanctions Policy based principally on the argument that the Part D requirements are a renewable obligation under the Act. While there are arguments in support of that position as outlined in the memorandum, the Agency would have to go through notice and comment rulemaking in order to change direction and would also have to explain the basis for its change. The final decision on the rulemaking would be subject to challenge as well as any individual decision to impose the sanction. In such a challenge, the Agency would be faced with the language of section 176(a), which appears by its terms to be limited to the 1979 and 1982 planning cycles, and its own prior interpretation. Moreover, the challengers could contend that the funding sanction interferes with the strong congressional policies behind the relevant funding statute, Title 23 of the United States Code. 40/ Hence, a court may conclude that Congress did not authorize restrictions on highway funding in the absence of specific language in the statute. The "one-time" theory concedes that there is no such language.

The legal difficulties are, thus, significant. We would be on the strongest footing if we had experience subsequent to the 1983 Policy with trying to get states to submit SIP revisions and had changed our view based on that experience. See, e.g., Michigan v. Thomas, No. 85-3674, slip op. at 11-12 (6th Cir. Nov. 12, 1986) (EPA may depart from precedents if departure is rationally explained). It is unclear at this point whether we can make such an argument. Even if we can, we would have to contend that Part D's requirements renew themselves, which in turn could undermine SPP inasmuch as Part D on its face seems to call for the submission of SIP revisions that assure RPP and attainment by a near-term date certain. In short, a change in position on the highway funding sanctions will be difficult to sustain and may raise some of the broader legal concerns previously discussed.

40/ See, e.g., 23 U.S.C.A. §101(b) (Supp., 1986): "It is hereby declared that the prompt and early completion of the National System or Interstate and Defense Highways . . . is essential to the national interest and is one of the most important objectives of this Act." We would argue in response that section 176(a) embodies equally strong policies against funding for highways in dirty air areas.

C. SPP or REEP in Extension Areas Without a Fully Approved Part D Plan

We begin directly with an assessment of REEP, addressing it roughly in the chronological order in which it is unfolding.

A key aspect of REEP is that EPA would not disapprove the Part D SIP for the relevant areas and would avoid triggering the section 110(a)(2)(I) ban, unless the state failed to make reasonable efforts to tighten the SIP. EPA is now continuing its deferral of action on the California SIP as a whole in relation to Part D. There is a serious risk that we will not be able to defend that deferral. We would contend, as we consistently have, that section 110(a)(3) affords EPA a reasonable time within which to act on a pending SIP submission. We would also argue that EPA may continue to act piecemeal on SIPs as long as the net effect is to improve air quality and to make reasonable progress toward attainment. A challenger would likely point out that the SIP for the REEP areas has been pending since 1982. EPA originally said that the purpose of its 1984 deferral was to allow an examination of the measures that would be necessary to assure attainment and that would be reasonably available for implementation by 1987. We would also be confronted with the argument that EPA has a mandatory duty to act on revisions within four months, and that EPA must approve a SIP if it would attain the NAAQS, and disapprove if it would fail to attain.

The prospects are very real at this point that EPA will have to defend the deferral to a court. 41/ The brief of the petitioner in the Abramowitz case is due on December 26, 1986. This case has the potential of precipitating in the near term a requirement that EPA approve or disapprove the California SIPs. In the case of California EPA is not operating under section 110(a)(2)(H), but rather under sections 110(a)(2)(I) and 172. It is difficult to structure an argument under those sections that would allow EPA to approve a SIP now that does not even purport to show attainment by 1987. The consequence of a disapproval is that the construction ban would then take effect, and a disapproval would also give rise to a claim that EPA must promulgate a federal SIP.

41/ EPA will probably have to face similar issues in the ACLPI citizens suit involving CO nonattainment in Phoenix and Tucson, and might have to face them if Sierra Club, NRDC, and Wisconsin follow through on their threats to file a citizen suits.

Even assuming that EPA's deferral either remains unchallenged or is successfully defended in court, EPA must still take action to implement REEP. As with SPP, REEP contemplates that a state will search for new available control measures, decide whether to adopt them, and then either implement the controls or justify a decision not to. EPA must approve or disapprove a committal SIP and the additional SIP measures that are developed through this iterative process. Once again, there is a significant potential of litigation over each of the Agency's decisions, both with respect to the general statutory issues and the specific determinations of "reasonable" control measures.

The legal risks associated with REEP are even higher than those associated with SPP. First, since these California SIPs have never been fully approved under Part D, the Part D requirements are still applicable. As indicated previously, one of the textual arguments supporting the flexible deadline approach for the SPP is that section 110 is the controlling authority where Part D obligations have been fulfilled and that section does not clearly establish a specific deadline. That textual argument is not available for the California SIPs.

To defend our approval of REEP SIPs, we would rely on the broad argument that EPA must reconcile the conflicting goals of the Act -- i.e., to attain the standards without causing severe economic and social disruption. In opposition, we would face, first, arguments grounded in the text of the statute, and, second, the argument that Congress anticipated the possibility of disruptive measures and meant for EPA to impose those measures, reserving for itself the right to open the legislative safety valve. In addition, it might be argued that the program fails to carry out its own stated premise, since it is not clear whether REEP would lead to steady improvement in air quality as opposed to lessening the rate of decline in air quality. Were the latter in fact the case, we would have to argue not only that the Act does not require attainment by a date certain, but that it does not require attainment by any date. The implications of a factual situation as severe as we may face in California highlights the difficulty of defending REEP in the context of a statutory structure that emphasizes attainment deadlines and that defines "reasonable further progress" as annual incremental reductions leading to attainment.

We conclude that, while there are legal arguments to defend REEP, the risk of an adverse court decision is significant, and the implementation of the program will present numerous opportunities for litigation that could substantially impede or negate our efforts.

Finally, the issue of sanctions against the state for failure to submit and adopt a REEP SIP is more straightforward than with SPP. Since California does not have a fully approved Part D plan, both the construction ban in section 110(a)(2)(I) and the highway funding restriction in section 176(a) are clearly applicable by their terms.

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